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Electrical World

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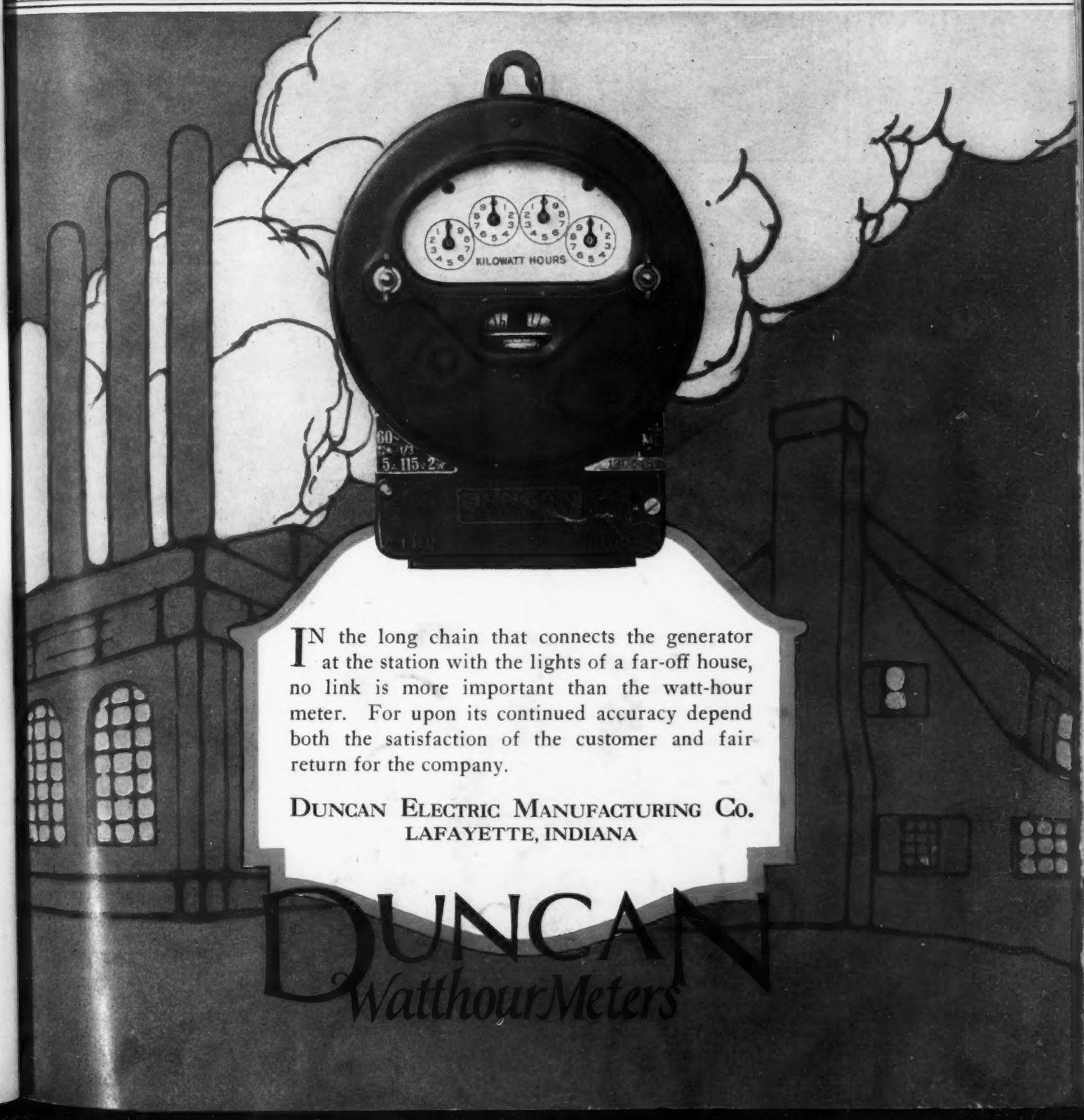

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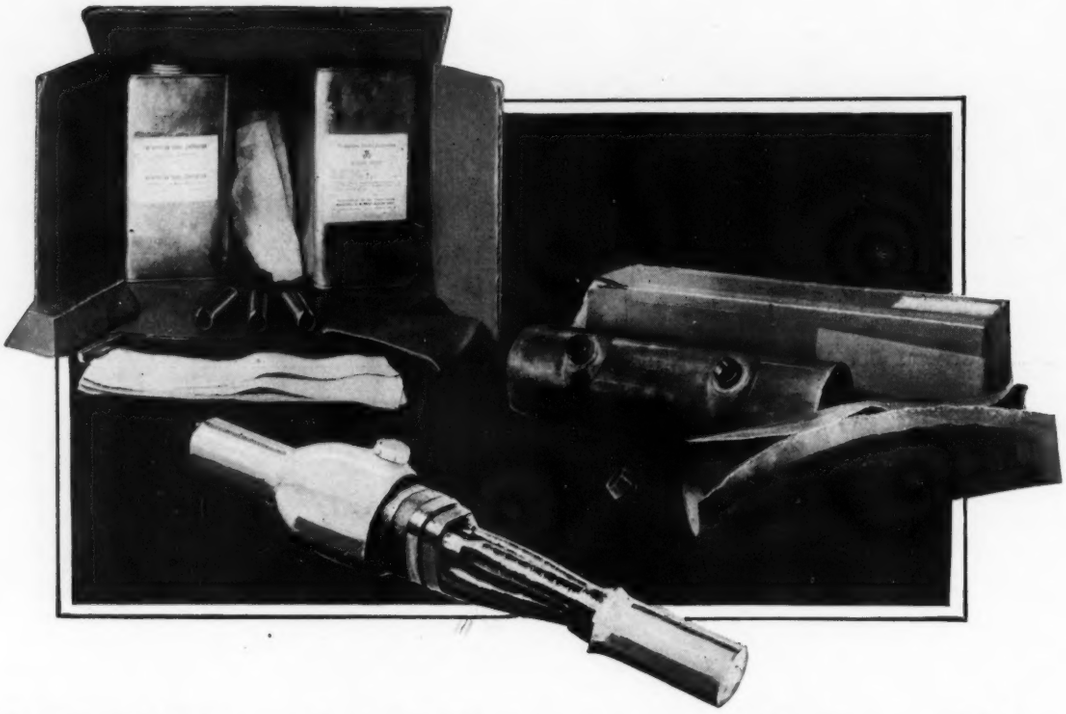

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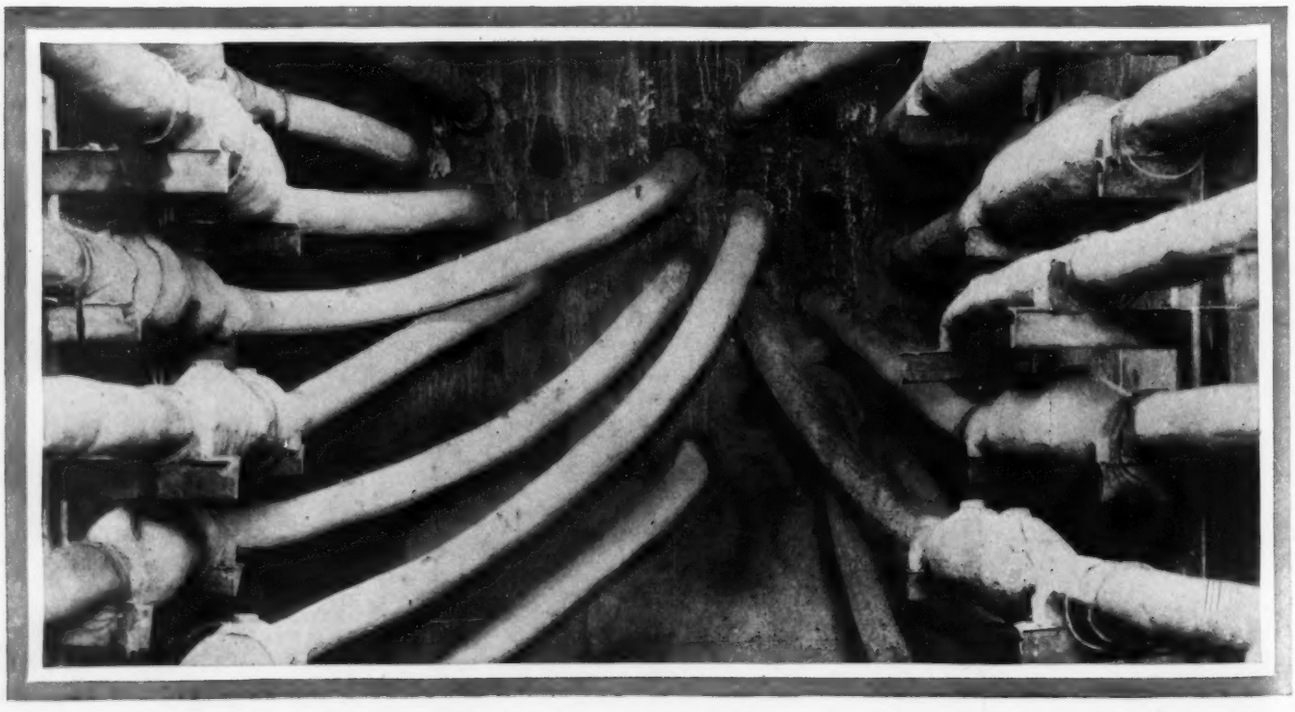

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Electrical World

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Editor

VOLUME 92 — *New York, Saturday, August 4, 1928* — NUMBER 5

Building a State by Service

UTILITIES in the South are establishing new records for service and are marking new trails in industry development. On page 219 of this issue is printed an article which relates facts concerning the Georgia Power Company and practices followed by it that go far to establish constructive industry policies.

Through the consolidation of utility properties and the expansion of transmission facilities the State of Georgia has gained tangible assets. Rates for electricity have been reduced in a large number of cities which were taken over by the extensive transmission system. This was possible because Georgia Power Company executives took advantage of the accompanying economies. But above and beyond the rate reductions and the resultant tangible savings to customers are other values. Poor service has been replaced with good service, unserved rural communities are now served, a vigorous merchandising policy has introduced electric conveniences into homes, street-lighting and store-lighting standards have been raised, and an aggressive power sales department has gone out into national industry to bring new enterprises into the state. Every agricultural area and every city in Georgia has been surveyed for its possibilities, and at utility headquarters may be found those data which are basic to the determination of suitable locations for any kind of industrial or agricultural development.

There is more than good business back of this kind of utility management and service. There is an unselfish desire to build up a territory and to prosper by aiding the state to prosper. Executives of the Georgia Power Company afford another example of the constructive statesmanship that earns public confidence and public understanding.

* * * *

Tax on Domestic Usage Retards Italy's Development

FIVE years ago there was a shortage of electric power in the industrial section of Italy. Today the problem confronting many of the electric light and power companies is how to dispose of the energy which is now being generated. Of course, it is appreciated that Italy possesses no coal but is rich in water power. It must also be borne in mind that Italy has a surplus of labor, so that labor-saving devices and appliances are not very welcome. And yet climatic and other conditions are such that great quantities of electricity could be employed profitably throughout Italy did it possess a rational system of electric rates.

Domestic opportunities for electricity far exceed commercial opportunities, but by reason of taxes imposed on lighting energy the disposition to use electricity freely is absent. The government imposes a tax approximating 2½ cents a kilowatt-hour on all domestic energy consumed for lighting, which in Italy is a lot of money. It would be a severe handicap even in this country. And yet the best interests of Italy as well as the best interests of the electrical industry would be conserved if the tax were imposed on the electric companies, to be by them distributed as seems best.

With an inducement rate for domestic service cooking by electricity would be made possible. Wood would be conserved as well as coal, and such uses as vacuum cleaning, refrigeration, etc., would be promoted. Mass production of electricity is well understood in Italy, but as yet large domestic consumption encouraged by inducement rates is unknown, owing chiefly to the inordinate tax imposed by the government. Until that tax is modified or removed electric expansion is out of the question and hydro-electric development must lag.

* * * *

The True Foundation for Public Information

IF THE power companies are not to operate public utility information bureaus to disseminate facts about the experience and results of their operations, how should they proceed hereafter in telling their story? The attitude of the Senate and the Federal Trade Commission would seem to indicate that such large-scale publicity activities by public service companies have made a bad impression upon the public and that some other way should be found to interpret the performances and plans of these corporations. For there can be no question of either their right to be heard or the necessity for it. Electric power companies are under public regulation and are owned by millions of citizens through share holdings, and the record of their stewardship should be made plain. Moreover, private operation of public utilities is under constant attack by the proponents of government ownership, and both the invested capital and the economic principles involved must be defended. For the right of free speech cannot be denied to a great industry just because it is a public service.

In our complex modern civilization neither a man nor a service can be known by good works alone. These good works must also be advertised and sold to be noticed and evaluated and employed. And power companies must advertise and sell by the most expert modern methods if they are to develop their markets and play their part in the world. Also they must explain and make themselves known and understood. It was to this proper purpose that the information bureaus were

dedicated, and had they been adequately directed and controlled probably all would have been well. But they were not, and it is doubtful whether such a distended organization as these state committees can be adequately supervised. Publicity is a boomerang which returns with violence on the slightest infraction of good taste. The safer way is the more natural, direct and effective process that leads every company to make its reputation and its friends in its own territory.

No matter how constructive and how true may be the information introduced into the schools through an organized publicity service in the pay of an industry, the public will resent the act as a tampering with a sacred institution, even though in many cases this information was requested by school authorities. But the executives of the local company can and should bring the same knowledge and understanding of the economics of modern utility operation to the teachers in the local schools, who are their friends and neighbors, and make their company policies and purposes known to their local lawmakers and press and public as a matter of natural local interest and responsibility. No possible criticism could be made of this.

The utility is also a local institution in the territory it serves. Its problem of publicity is mainly local. Its obligation is to local public opinion, and there also lies its opportunity. And if confidence and sympathy is well founded in each locality, the merit of the industry will be known to the nation.

* * * *

Niagara and Boulder Canyon Boards at Work

CONGRESS has adjourned until December, and non-political agencies are now occupied with Boulder Dam, Niagara Falls and other water-power projects of importance to the electrical industry. Impartial fact-finding committees are at work on a study of Niagara and the Colorado River and should produce facts and opinions that will help bring about an early decision.

The interim report of the special international Niagara board on the preservation of Niagara Falls, as read before the American Society of Civil Engineers in Buffalo on July 18, is to be commended. It recommends the immediate construction of works to rewater the bared flanks of the Horseshoe Falls and states that the cost will not exceed $1,750,000. A second step recommended is the construction of works at Grass Island to rewater the American Falls. As a final conclusion, the board states that these works will permit actual tests to be made as to the effect on the scenic beauty of the falls of further use of water for power. This report gives a sane and logical program which should be acted upon favorably.

Five experts, three engineers and two geologists, form a board to report to Congress before December 1 on the possibilities of a Colorado River dam. This board, as elsewhere reported, held its first meeting in Washington on July 30 and elected General W. L. Sibert as chairman. He announced that the survey of facts and sites would be made as soon as possible and outlined a method of procedure which does not involve open hearings devoted to the political aspects of the Colorado project. The work of General Sibert at Panama and on other projects and the personnel of the board afford a favorable and competent background for a report which should be very valuable to Congress.

The board method of procedure in handling controversial legislative matters has many advantages, but it has weaknesses also, because the final decision must be made by political bodies. The impartial boards may find the facts and make the recommendations, but public sentiment must be used to get decisions in conformity with the reports. The electrical industry has much at stake in these matters and should support these boards in their impartial analysis of facts and opinions.

* * * *

Transformers and American Animations

IN EUROPE three-phase transformers are almost universally used in distribution service, while in the United States the most common practice is to use single-phase. Every once in a while some one at a technical session arises to inquire the whys and wherefores of this situation, alleging the obvious economy of one as against two or three units. It is stated that in this country the cost of three-phase transformers in the larger distribution sizes is, pound for pound, higher than that of single-phase. But this is a condition caused by the much larger production of the latter and one that would disappear if three-phase transformer production were increased.

There are many reasons, all good, why in spite of its lack of wide approval in Europe, the single-phase transformer is favored on the west side of the Atlantic. Single-phase banks are more flexible than one polyphase unit. Failure of one transformer does not necessarily deprive the customer of service. Unbalanced loads are better served. One company changed from three-phase to single-phase transformers in industrial substations because there became apparent a tendency on the part of customers to reduce allotted station space, thus not providing adequate cooling facility. A single-phase bank of three units requires one spare of one-third the capacity of the bank. To insure the same reliability for a three-phase transformer requires a duplication of capacity. To all of these reasons, apparently true as they are, there are antithetic arguments that appear just as true to the polyphase advocate.

But the advancing of reasons and arguments in favor of either single-phase or three-phase transformers is mere rationalizing. The real cause of the difference between European and American transformer practice is contained in a deeper spring of behavior than consideration of items of performance and cost. It is in the fundamental variation between the "geists" of America and Europe. In the Old World people are everywhere surrounded by structures that have endured for ages; they are encompassed by customs and manners of doing that have persisted from generation to generation; a structure or a practice is built for use and, not less, for permanence. In the United States there are fewer survivals, either structures or practices, from other days. The people consider today with little reference to yesterday; they build for use; permanence is not *per se* a virtue; a present thing is best only until the future brings a better. Therefore the American manner of thought contemplates change and makes provision for it by arranging the present things as flexibly as is consonant with adequate performance. There is a finality about a three-phase distribution transformer that does not fit into the American credo.

Improvement Seen in Home Fixture Designs

WITH mass production the electrical industry has little quarrel, but in the field of residential lighting a trend toward a wider individualism in fixture designs has a growing place. Period furniture is pointing the way. The prevalent vogue of Colonial art and the interest of home builders in the styles of the Napoleonic Empire and, still farther back, in those of the Middle Ages offers a rich opportunity to the fixture retailer who is building up a discriminating clientèle on the basis of a designing service of the better grade. Along with the popularization of designs lending themselves to mass production and distribution for the lower-cost and medium-cost home market can be seen a movement toward greater selectivity, and this trend is by no means confined to the metropolitan centers.

Skillful adaptations of design from antique fittings are now being made for specialized sale in the retail fixture stores at prices representing but a small percentage of the total cost of the home. It is said on good authority than an allowance of, say, 1.5 per cent for fixtures in a residence costing $20,000 to $25,000 will yield the owner a lighting installation of marked individuality, taste and serviceability. The percentage may vary, but the introduction of the principle of selectivity into fixture buying, as in the purchase of furniture and interior decorations, marks real progress toward the treatment of the entire problem of home electrical equipment on a broad and elevated plane formerly too often absent. The range of decorative effects now possible to skilled artificers in brass, copper and glass is so great that it is hardly too much to say that the field of home lighting is entering a new era of discriminating expansion.

* * * *

Are Electrons Particles or Waves?

CONFUSION and uncertainty seem to multiply in the field of experimental physics. Recent years have seen the theory of relativity present such serious inconsistencies as to threaten the very foundations of firmly established classical theories of physical phenomena. It appears to be necessary to picture light and radiant energy as somehow traveling in pulses, as well as in regular trains of waves. To reconcile these and other similar inconsistencies would appear to require processes of reason, beginning on types of fundamental postulates entirely different from those on which we have all been brought up.

Another instance of such apparent contradiction is presented by the beautiful work of C. J. Davisson on the reflection of electrons from crystals, announced some months ago, but recently presented by the author before the Franklin Institute with many delightful personal commentaries. This time the contradictions are emphasized in that both sides are clearly shown by direct experiment. The contradiction is that the electron, always up to this time assumed to be a discrete particle, is found under certain circumstances to behave exactly like X-rays, long assumed, as based on extensive experiments, to possess the character of waves.

Davisson asks the question, "Are electrons waves?" and can answer it only by another question, "Are X-rays waves?" He reaches the conclusion that if X-rays are waves, so also are electrons, but hastens to add that we are no longer so certain as we used to be that X-rays are waves. The new experiments on electrons, it will be recalled, show that they exhibit regular and selective reflection, as well as diffraction from the surfaces of crystals, in exactly the same way as do X-rays. In the case of the latter the curve showing selective reflection provides the means of computing the wave length of the rays. Exactly similar curves on electron reflection not only suggest their wave character but almost permit computation of their wave length. As Davisson says, it is quite paradoxical and confusing. We must recognize not only that there is a certain sense in which rabbits are cats, but there is also a certain sense in which cats are rabbits.

* * * *

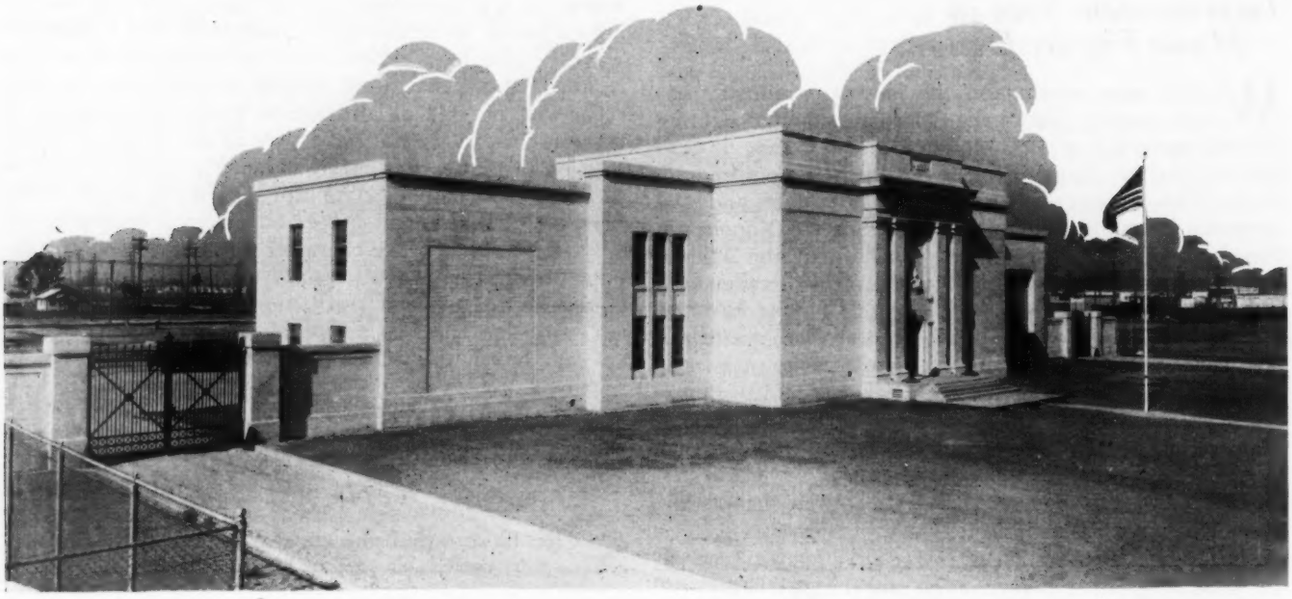
What Should Committee Personnel Represent?

SOON there will be numerous appointments of new committees by the various national and divisional associations of the electrical industry. Those responsible for the appointments will be asking, "Who is the best man for chairman?" and "Whom can we get to work with him?"

Now, the work of a committee is supposed to represent compositely the best thinking of that particular branch of the industry. A committee is supposed to discuss pro and con both sides of a problem and bring forth an answer. But too often a committee personnel is made up of "yes men," or they are all of the same mind to begin with and the nature of the committee report is a foregone conclusion. There are always at least two sides to every question. One may be right and the other wrong, both absolutely or only partially so. But, right or wrong, each is entitled to its day in court, so to speak. This is impossible in committee work, however, if the personnel is selected to represent only one side of a controversial question. It is a "stacked deck." The report of such a committee will be accepted as gospel by those already in general agreement with the committeemen, but it will also be discredited by others of different views. In other words, the report is biased and cannot have the effect of unifying opinion because the committee personnel did not represent a true cross-section of existing practice and opinion in the industry.

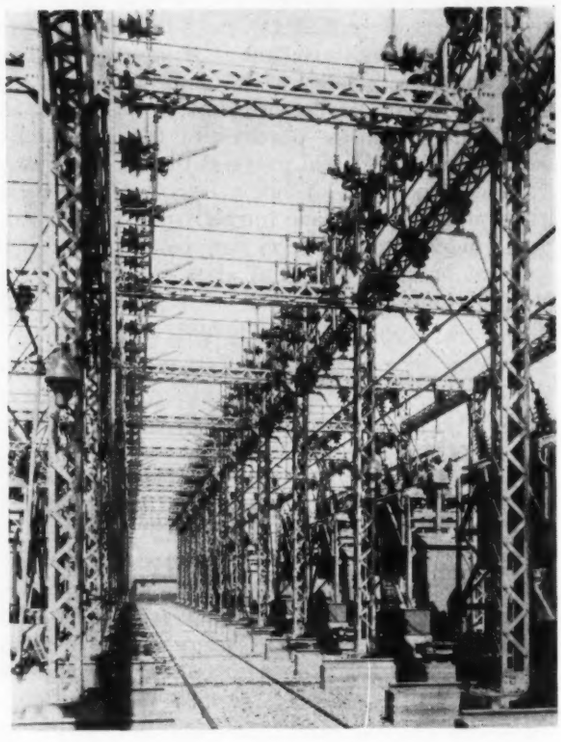
With less and less opportunity each year for discussion from the floor at conventions, it has become increasingly important that committees should truly represent their branch of the industry. It is in the committee meetings that important discussions take place and decisions are made. When the members are all of the same mind there is strong temptation immediately to vote a unanimous agreement and empower the chairman or secretary to write the committee's ticket. Reports should represent the varied thinking and conditions in the entire industry. If the committee personnel is selected with this in view, the results of its work will be far more authoritative and recommendations more widely accepted than is sometimes the case when there is the suspicion that the personnel was "hand-picked" to produce certain predetermined effects.

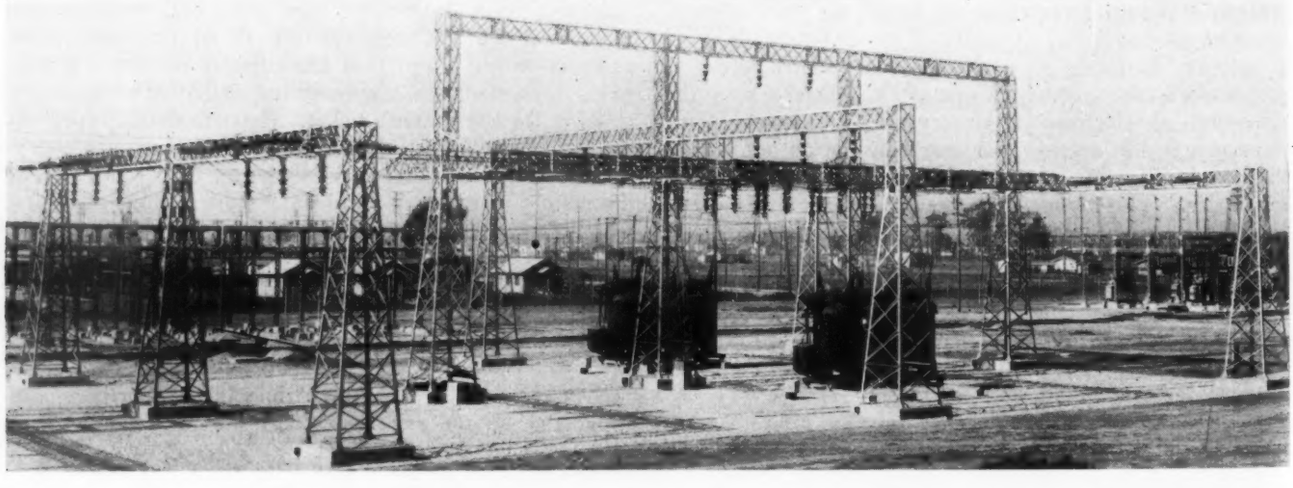
Committee appointments should consider two things: First, the executive ability and open-mindedness of the chairman; second, a membership which collectively has knowledge of and experience with all sides of the problems to be considered.



132/33-Kv. Receiving Station in Los Angeles

TO PROVIDE for load growth in Los Angeles during the next twenty years 132/33-kv. receiving stations of the type shown are connected with duplicate 132-kv. belt lines around the city. These stations, in turn, feed distributing substations. Loose coupling, involving reactors, is employed to limit short-circuit currents and, consequently, the duty imposed on oil circuit breakers. The 33 and 132-kv. bus structures are shown at the right and below respectively. Space is provided for six 132-kv. breakers. The ultimate capacity of this receiving station is 320,000 kva., in four 80,000-kva. units. Features of the station are discussed on page 209.





Electric

Annealing and Normalizing

at Timken Plant

Satisfactory experience with electric furnaces for heat-treating alloy steels leads to 3,600-kw. installation with 1,850-kw. for electric normalizing and annealing

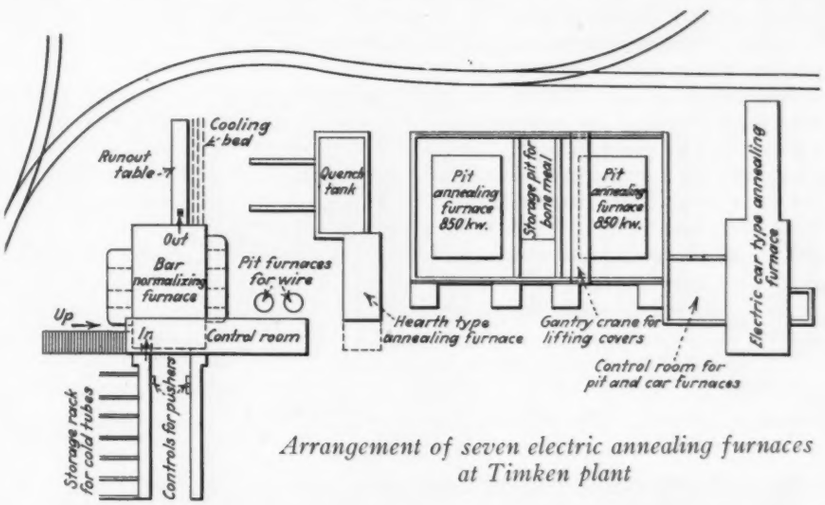
By M. T. LOTHROP
Vice-President Timken Roller Bearing Company
Canton, Ohio

FOR SOME years the Timken Roller Bearing Company has been a large producer of high-grade electric furnace steels, both for its own consumption and to supply the demand for alloys that has grown up among other manufacturers. The proper annealing of such steels in bulk constitutes a rather difficult problem because of several factors involved. Among the most important are the long time cycles necessary in some cases, the accurate temperature control required and the control of the furnace atmosphere which must be maintained. It is not surprising, considering the company's experience with electric melting furnaces for meeting very similar requirements, that electric heat should be adopted as the best solution of the annealing problem. The principal difficulty in the way was the designing of electric furnaces that would meet the particular annealing requirements of different types of steel.

As a result of work in collaboration with electric furnace engineers, a group of eight electric annealing furnaces of various capacities and types of construction have been installed, which handle the entire annealing work for the plant and have a total connected load of about 3,600 kw. Two additional furnaces to be installed during the year will raise the total to 5,450 kw. Of the eight, all but two were especially designed and built for their particular purposes by the Electric Furnace Company, Salem, Ohio. For convenience in handling material, seven of them have been grouped and the eighth is about to be placed with them.

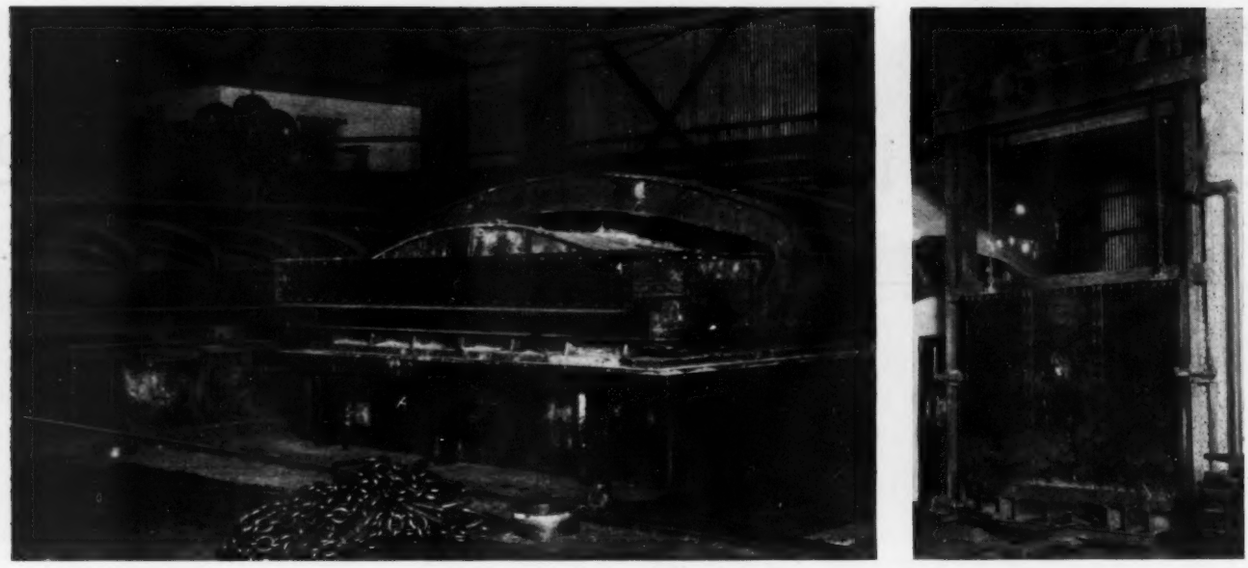
Probably the most remarkable of the group, in point of size and character of design, are the two 850-kw. pit annealing furnaces. These furnaces were specially built for annealing high-carbon chrome steel, or any other steel where the annealing cycle calls for a slow cooling. The long cycles required have hitherto been a decided obstacle to the use of electric heat for annealing such steels on anything approaching a quantity basis. In a well-insulated furnace the cooling time was usually so long that production was seriously delayed. In the case of these particular furnaces this difficulty has been overcome by the introduction of a special feature in the furnace construction to accelerate cooling.

Each furnace is 9 ft. wide by 21 ft. long, inside, with a loading depth of 6½ ft., and accommodates charges of bar or tube stock of weights up to 50 tons. The covers are separately framed structures, weighing about 25 tons apiece, fitting in sand seals around the top of the pit, and are lifted off and onto the furnaces by a special electric traveling gantry crane running on tracks at the floor level on each side of the furnaces. The heating elements are of the T-grid type, mounted on the side walls and bottom of the pit. They are divided electrically into two circuits, one including the side-wall elements and the other those in the bottom. Each circuit is provided with individual control, which gives two sets of connections, one 440-volt, three-phase Y for high starting input and the other 440-volt, single-phase series for soaking heat. The first has a power demand of 425 kw. for each circuit, or 850 kw. total, and the latter 142 kw. for each, or 284 kw. total. An accompanying illustration shows the method of mounting the resistors and also the method of protecting them from damage during charging or discharging by means of heavy heat-resisting alloy guides.



Arrangement of seven electric annealing furnaces at Timken plant

The operation of the furnace is, briefly, as follows: The material composing the charge is brought up to the annealing temperature of 1,450 deg. F. as rapidly as possible, at which point the circuit is cut over from Y to series and the temperature held long enough to insure uniform heating of the charge. The charge is then slowly cooled through its critical range, the process being carefully regulated to insure the exact metallurgical results



Two 850-kw. pit annealing furnaces with covers that can be lifted by crane and 315-kw. car type furnace with car elements connected

desired. After the critical range is passed, cooling is accelerated by means of an air-blast system, which consists of a series of pipes built into the furnace, through which cooling air is forced by means of two 20-hp., motor-driven, high-pressure centrifugal blowers. Part of this system can be seen in the view of the furnace. It is this forced cooling system that has rendered long time annealing practical on a commercial basis in these furnaces. It has eliminated the possibility of exposing the charge to the air before it has cooled sufficiently and at the same time it removes the objectionable feature of too long a cooling period. The total annealing time from charge to charge is just about cut in half by the use of forced cooling. A third 850-kw. pit furnace of the same general construction and operating principle will be installed shortly.

All high-carbon chrome steel is, before annealing in the pit furnaces, normalized in a 700-kw. pusher-type normalizing furnace. The furnace is also used to normalize certain low-carbon steels and for processing steels that have to meet cold shear tests. The furnace is 12 ft. wide by 21 ft. long inside and is capable of handling bars up to 5 in. square by 20 ft. long, or tubes of corresponding dimensions. It is equipped with three pusher mechanisms, two being located at the charging end and one at the side. The latter, a view of which is shown, was developed to push the charge across the width of the furnace interior from the charge to the discharge side. It consists of five rails crossing the furnace interior at equal intervals and terminating on the discharge side in a large trough which delivers to a flight conveyor for returning the carrier shoes to the transverse pusher. The actual pushing is done by a number of shoes, or baulks, in each trough, which are propelled across by the rods of the pusher mechanism proper. The charge rests on these shoes and is carried across the furnace by the movement of the shoes in the trough. When the shoes come to the discharge side they are delivered to the conveyor and

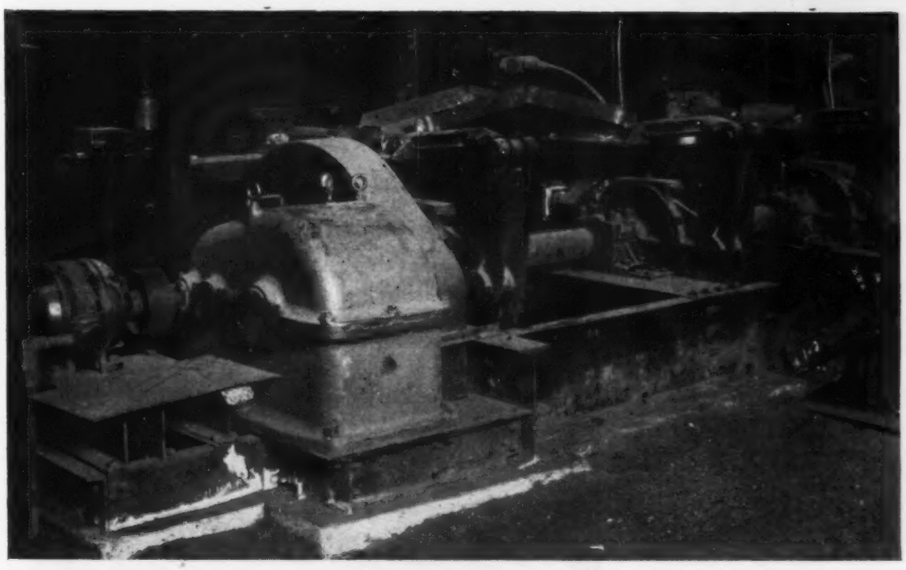
300-kw. heat-treating furnace adjacent to two small pit furnaces and 460-kw. car type furnace which is to be moved near the others

returned to the loading side for use. The pusher mechanism is so designed that the motor circuit is tripped at the completion of one revolution of the cams, so that the distance of movement is limited. The other pushers are of the rod type and serve to push the charge in and out of the furnace, respectively.

The T-grid heating elements are mounted partly on the furnace roof and partly in transverse wells located between the piers which support the cross pusher shoe troughs. Some idea of the method of mounting can be obtained from the view of the interior of this furnace. Electrically, the heating elements are divided into four separate circuits, each with individual control.

The operation of the furnace is quite simple. The stock to be normalized is pushed in by a motor-driven pusher. By virtue of the electric connections that have been adopted, it is subjected to a high initial heat on entering, the degree of which is lowered as it moves across the furnace. Arrived at the finishing, or delivery, side, the work is pushed out of the furnace onto a run-out table which is equipped with manipulators, which deliver it to a motor-driven cooling bed. From the bed it is delivered directly to the cradles in which it is to be loaded into the pit annealing furnaces. The controls for all the motor-driven operations, including the side pusher, are located on the charging side, so that the furnace can be operated by one man. The capacity of the furnace is about 150,000 lb. of stock per day, with a power consumption of about 200 kw.-hr. per ton. An additional furnace for normalizing work will be installed later in the year. It will be rated at 1,000 kw.

Heat treatment of bar or tube stock of various alloy steels is accomplished in a 300-kw. hearth type furnace. This furnace is also used for the normalizing of small lots of steel which it is impractical, for one reason or another, to handle in the large unit. The furnace is of the double-end type, being about 20 ft. x 6 ft. x 4 ft. inside. The stock to be annealed is charged in at one door by a motor-driven pusher and, after it has been uniformly heated, pushed out of the other onto a receiving table. This table is tilted by another motor-driven mechanism and the stock dumped into an oil-filled quenching tank. It is removed from the tank by a motor-driven conveyor.



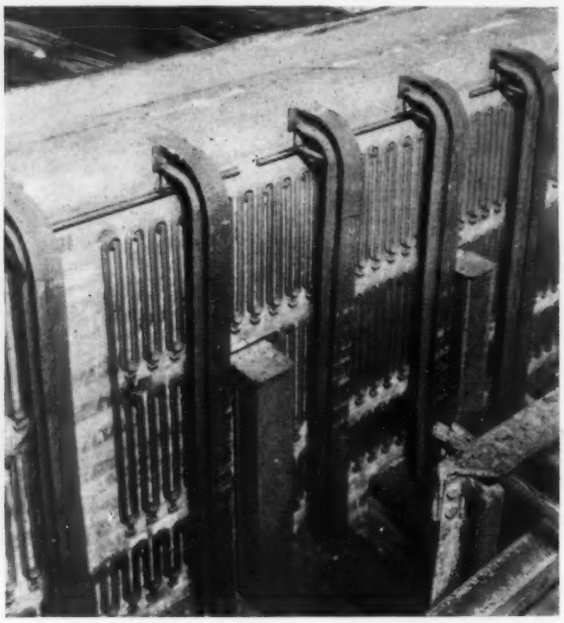
700-kw. normalizing furnace with motor-driven side pusher mechanism and having tapered roller bearings

In order to compensate for any local cooling that may take place at the ends near the doors, the heating elements have been grouped into three zones, two door zones and a central or main zone. As to mounting, part of the grids are mounted on the roof and part underneath the hearth.

Two small circular pit furnaces have been installed for treating rods in coils. They are each rated at 100 kw. and are separately supplied from 440/125-volt, single-phase transformers. They are to the right of the hearth type furnace just described.

Miscellaneous bar stock, especially that which does not require annealing cycles of more than 24 hours' duration, or that can be discharged into the open air at high temperatures, is annealed in two car type furnaces. One of them, a 315-kw. car type furnace, built by William Swindel & Brothers, Pittsburgh, is shown here. The inside dimensions of this furnace are 22 ft. long x 6 ft. 4 in. wide x 5½ ft. high. The car dimensions are 20 ft. long

x 6 ft. wide x about 3 ft. high. The normal rating of the furnace is 20,000 lb. per charge, but the car will carry a load of twice that if necessary. The heating elements are mounted on the roof and side walls of the furnace proper and on the car bottom. The latter is divided into thirteen wells by fire brick piers built up from the car bed. The elements are mounted in these wells and the whole covered with interlocked alloy sheets that form



Resistors on side walls of pit furnaces protected by guides

the hearth. The elements are directly connected to the 440-volt, three-phase supply circuit, two connections being available, three-phase delta for high initial heat and three-phase Y for holding or soaking heat. Automatic temperature control is obtained by means of a Leeds & Northrup potentiometer type single-point controller recorder. The average energy consumption is 355 kw.-hr. per ton.

The car is moved in and out of the furnace by a motor-driven rack and pinion mechanism. Connection for the elements on the car body is made by a bushing and coupling located at one side of the door. A very elaborate system of sand seals has been adopted to prevent uneven temperatures in the furnace interior due to the leakage of air from the outside. The door is provided with a seal at both top and bottom and there is a seal on each side of the car, which engages with a knife edge on the furnace wall. The furnace is also equipped with vertical cooling ports in the side wall, by which the rate of cooling can be accelerated if desired.

The second car type furnace shown, which was furnished by the General Electric Company, differs considerably in its design and construction. The inside working dimensions are 28 ft. long x 4½ ft. wide x 2½ ft. high, the over-all sizes being 34 ft. x 9½ ft. x 16 ft. The car proper is 33 ft. long, 5½ ft. wide and has an over-all height of 5¾ ft. It is equipped with a cradle which raises the charge above the lower level of the heating elements on the side wall.

The heating elements are all mounted on the side walls, there being none on the roof or on the car. They are divided into two zones, each with separate control. The design of the elements proper is such that extra heat is provided near the door to compensate for door losses. Their location on the walls brings the lower ends below the level of the charge on the car, so that heat may be radiated up through the charge. The furnace is supplied with power at 220 volts, each zone forming a separate circuit. Two connections are available for each circuit, delta for high heat and Y for soaking heat. The former condition has a power demand of 230 kw. per zone, or 460 kw. total, and the latter a demand of 153 kw. per zone, or a total of 306 kw. The furnace has a normal capacity of 10 tons, but, like the other, it has 100 per cent overload capacity. On a maximum heating cycle of nine hours the power consumption averages about the same as that of the other car type furnace.

The installation of electric furnaces for these heat-treating operations in the Timken Roller Bearing Company's plant were made only after careful consideration of the equipment available and the requirements to be met. Past performance of the initial installation of electric furnaces led to the additional equipment which is now in use and the very satisfactory results which are being obtained influenced the decision further to increase the use of the electric heat-treating furnaces which are now being constructed.

Test Kit Aids Metermen in Georgia

A PORTABLE testing set for use by metermen in the recalibration and checking of domestic watt-hour meters has been adopted by the Macon (Ga.) Railway & Light Company with resultant time savings. The equipment was developed by that utility and consists of one Ohio Brass $\frac{1}{10}$-amp. rotating standard, one States Company phantom load, a tray for tools, oil, gas, seals, brush, etc., and one set of cords, all inclosed in an 8x10x10-in. aluminum case.

According to L. P. Jones, superintendent of the meter

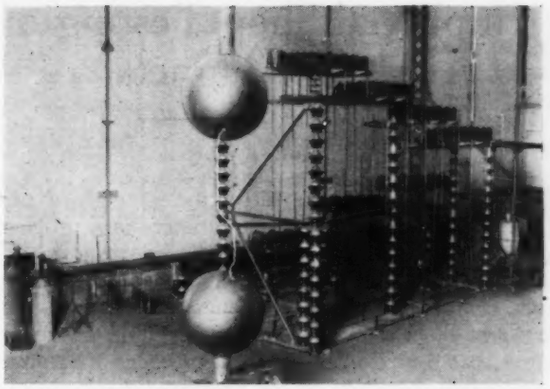
Aluminum case for test outfit offers advantages of light weight and rapid use

department, the arrangement has the advantage of having the test meter and load permanently connected and requires only a pair of test clips for attachment to the source. A decided saving in time and a satisfactory outfit have been secured, in the opinion of Mr. Jones. The weight of the equipment described is 14½ lb. complete.

Variable-Wave High-Voltage Tests with Surge Generator

By P. H. McAuley
Material and Process Engineer
Westinghouse Electric & Manufacturing Company

THE performance of apparatus that may be subjected to abnormally high transient voltages can be studied readily under similar surge conditions in the Westinghouse high-voltage laboratory at Trafford City, Pa. The lightning or surge generator, which produces impulse voltages corresponding to those occurring on transmission lines, consists of twenty groups of condensers arranged for charging in parallel and discharging in series. Thus, the charging voltage of 100 kv. is multiplied to 2,000,000 volts or more. With reflections, twice this value is theoretically attainable. The figure shows a 150 cm. (5 ft.) diameter sphere gap at 250 cm. (8⅓ ft.) separation breaking down on a 3,000,000-volt surge. The generator may be seen in the background.

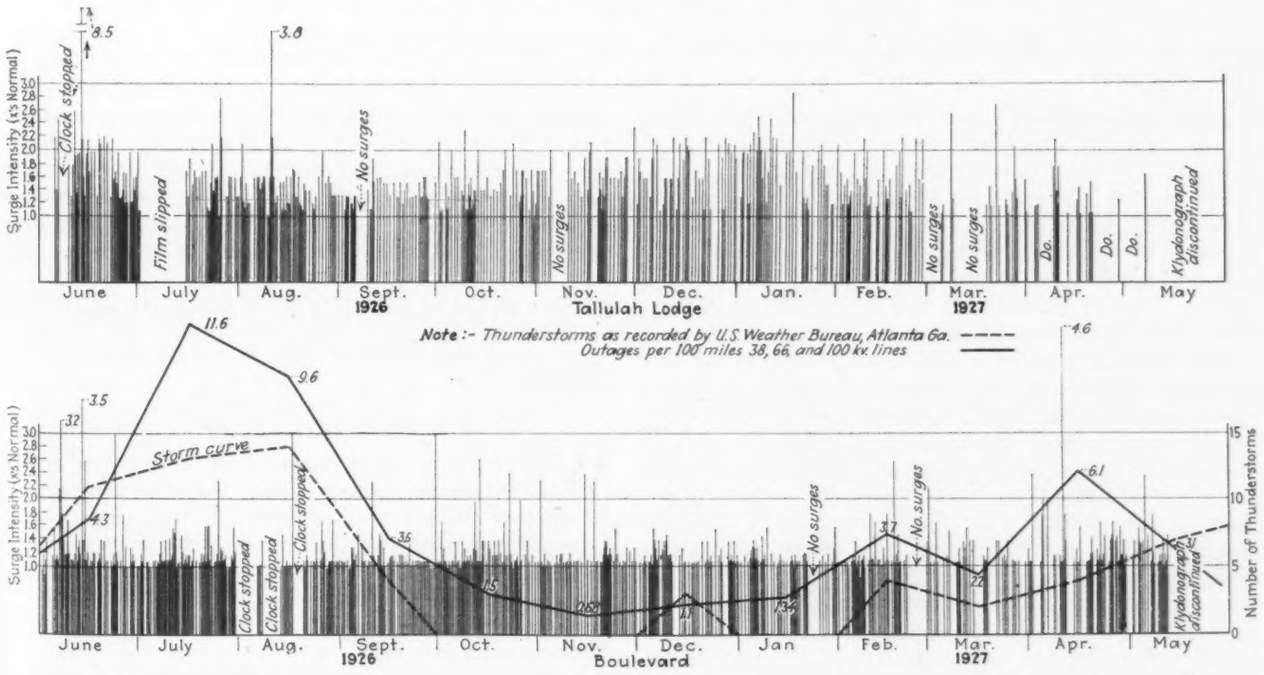


3,000,000-volt surge jumps sphere gap in laboratory tests

The inherent properties of the generator coupled with a large condenser capacity make possible the production of voltage waves that not only simulate actual line surges but exceed in steepness and voltage any surges which have been recorded by the klydonograph or cathode-ray oscillograph. The rate of voltage rise or the wave front may be readily controlled by varying the characteristics of the discharge network. The maximum generated voltage is a direct function of the breakdown voltage setting of a master intergroup sphere gap. The duration of the wave can be controlled through the discharge resistance. The surge generator is exceedingly flexible and without restriction concerning the form of the voltage wave. This is particularly important, since the wave forms produced by lightning on transmission lines vary over a considerable range. Moreover, this type of surge generator can be extended easily to greater capacities or higher voltages with moderate economic limitations.

The most important function of a high-voltage surge generator is to facilitate study of the performances of various forms of high-voltage insulation. In this connection detailed investigations have been made on the time lag or breakdown of insulation, on the electrostatic fields surrounding insulators and on the effectiveness of protective equipment such as arcing rings and lightning arresters. Designs which were considered adequate from 60-cycle studies are being modified to conform with surge test results.

Surges at Two Stations on 87-Mile Line Recorded by Klydonograph



KLYDONOGRAPH records of the surges at the generating substation (Tallulah Lodge) and distributing terminus (Boulevard-Atlanta substation) of an 87-mile transmission line covering the period of a year have been secured by the Georgia Power Company. The curve of outages superimposed on the Boulevard station record follows closely the thunderstorm frequency as noted by the Weather Bureau. While the intensities of surges are at variance at the two points the frequency with which they occur indicates the system relationships.

Improved Shop-Testing of Meter Magnets

By Herbert C. Moyer
Meter Engineer Pennsylvania Power & Light Company, Hazleton, Pa.

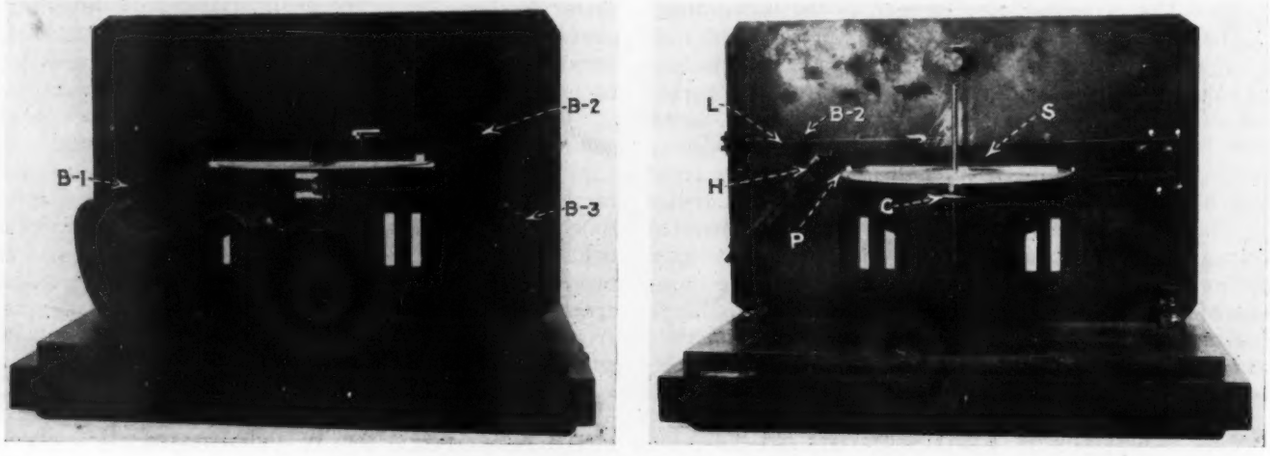
THE reliable measurement of the strength of permanent magnets for watt-hour meters is a problem of considerable importance to utility men responsible for the correct maintenance of meters and relays. When a meter gives evidence of a change in magnet strength there are generally one or more variable or unknown factors that throw an uncertainty into the determination of the actual condition of the magnets. Consequently it is desirable to determine the strength of a doubtful magnet by some means independent of the possible variables in the meter or in the source of supply. To fill this need a simple yet effective magnetometer was designed by the writer and built in the meter and instrument repair shop.

The device consists essentially of a standard induction meter moving element with a few simple modifications. It is mounted in normal position on a brass plate frame provided with brackets to hold the various types of magnets to be measured in proper relation to the disk and against stops or spacers to secure uniformity of the distance from the center of the disk.

The disk is graduated in 200 divisions, numbered consecutively opposite to the direction of rotation so that a small angle of rotation will be indicated by a higher number than a larger angular rotation when the disk is brought to a stop by the magnet under test. In the periphery of the disk is cut a small notch to receive the lip of a flat spring. This spring when deflected backward from the frame by means of a button is held in a fixed position by a latch, which in turn is released by pressing another button. In order properly to locate the disk so that the lip of the spring will engage with the notch, a heart-shaped cam is placed on the staff under the disk. This is operated through a spring-supported cam roller which is pressed against the cam by a pushing button on the front of the frame.

When the disk is set by successive operation of the buttons and then released, the disk is set in rotation by a quick, short impulse from the spring which disengages itself from the notch after pushing the disk through an angle of about 10 deg. The disk then rotates under its own momentum until it is brought to rest by the braking effect of the eddy currents induced by the magnet under test.

Since the momentum of the disk is set up by the impulse from a constant spring, released from a uniform deflection, the measurements will be found to be very nearly uniform or free from the variable factors present in most systems of magnet measurement. The various parts are so proportioned that an average meter magnet will stop the disk in approximately one-half of one revolution. Since the counter or braking torque set up by the magnet varies as the square of the flux or magnet strength, and the disk stops rotating when this counter force has equaled the propelling force of the momentum of the disk, the readings obtained will be nearly proportional to the square of the flux. This corresponds to the braking effect of the meter. These readings may be repeated successively with a variation of less than 1 per cent. For comparison with the original measurement, usually marked on the magnet according to some system of arbitrary values, it is desirable to establish a calibration curve between the two systems of measurements.



Magnet-testing device simplifies meter maintenance

Both sides of the test panel are illustrated. B_1 and B_2, setting buttons; B_3, releasing button; *S*, impulse spring; *H*, holding latch; *P*, notching device; *C*, cam set; *L*, connecting link.

Quick Check for Three-Phase, Two-Meter Measurements

By E. E. Kimberly
Robinson Laboratory, Ohio State University

WHERE three-phase power is to be measured by the two-watt meter method there is always the question of whether the low reading meter is indicating positive or negative power. Various methods are used involving the opening of the load circuit, which is sometimes not permissible.

Assuming a balanced load of other than unity power factor, one meter will read lower than the other. If the potential lead of the low reading meter be removed from the common line and be connected to the third line this meter will read forward if the power factor is above 50 per cent and backward if the power factor is below 50 per cent. This affords a positive test that does not disturb the load circuits.

Investment Tests for Utility Bonds*

Recent legislation governing savings bank investments emphasizes ratio between fixed charges and available income

By John W. Stedman
Vice-President Prudential Insurance Company of America

CONSIDERING statutory provisions governing investment by savings banks in public utility bonds, it is of interest to note that the more recent legislation enacted in the last two or three years has based one of its principal requirements on the relation of fixed charges to available income. The laws of New York, Connecticut and Massachusetts specify a ratio of two to one. This is well as far as it goes, but for the reason that many companies do not include charges for depreciation or for renewals and retirements with other operating expenses, as is the accounting practice of the railroads and the American Telephone & Telegraph System, the net income figures in such cases do not correctly represent earning power.

You cannot blink the fact that if in rendering service a large part of the plant is worn out or must be scrapped because it is too obsolete to render the economical and efficient service the public requires, the cost of such used-up part of the plant is an expense of rendering service. From current earnings, therefore, this cost must be met, either in a lump sum in the year when such retirement and renewal take place, or piecemeal over a series of years until a sufficient fund or depreciation reserve has been accumulated. But under either method of defraying this cost the payments should rightfully be accounted for as part of operating expenses instead of being shown as appropriations from the income remaining either after deducting interest or after deducting preferred dividends. It is to be deplored that the practice is still too prevalent in bond circulars of excluding depreciation or retirement charge-outs from the income statement, except perhaps for a mere reference that the balance shown after interest may be devoted to the payment of dividends and depreciation.

New Jersey's Statutes

It would appear, then, that the two to one ratio is not as high a standard of earning power as it purports to be. In the New Jersey statute, however, the requirement that net revenues before federal taxes, renewals and depreciation must have equaled for three years 2½ times annual fixed charges for rentals and interest on all outstanding mortgage indebtedness, by recognizing the lack of uniformity in public-utility accounting and the frequent omission of depreciation charges, furnishes a more searching test. Moreover, besides mentioning depreciation and federal taxes, it is in its phraseology in one respect more precise, in that it specifies that rentals in addition to interest shall be taken into the reckoning. The rentals mentioned refer, not to contracts to purchase energy, or to pay for the use of facilities like poles or conduits belonging to other companies, but to obligations to pay interest and dividends on the securities of leased companies. The latter are properly fixed charges, while the former are usually classed among operating expenses. I point out this distinction because the inclusion of leasehold obligations in operating expenses, as is sometimes erroneously done, reduces fixed charges proportionately more than net income and thereby presents too favorable a relation.

The New Jersey statute differs in another respect from the statutes of the three other states; it does not provide that dividends at the rate of 4 per cent shall have been annually paid, or, as in the New York statute, earned, for a term of years on the capital stock. As I indicated in discussing this feature in the railroad section of the state laws, such a provision is really superfluous and beside the point. When the proof of adequate earning power has been demonstrated by the margin remaining after subtracting fixed charges from net income, it matters not at all what rate of dividend has been earned or paid, or how much or how little is the amount of stock outstanding. What does matter is the tangible evidence that the management has prudently and conservatively refrained from dissipating the company's cash resources. In view of the fact that a very large number of public utility operating companies are controlled by hungry holding companies this evidence is especially important. To require, as I proposed in the case of railroad investment, that the dividend payments in cash of a public utility company should have averaged for five years not over 80 per cent of the average available income would serve as a warning to the owners that a temperate rather than a greedy appetite was desirable if the bonds of the operating utility are to be rated as savings bank investments.

However, as this might discriminate too harshly against those companies which include liberal charges for depreciation or retirements in operating expenses, I suggest that the provision of the law might be framed as follows: Investment in the kinds of bonds (i.e., first mortgage underlying and refunding mortgage, as now described in the statutes) of public utility companies, the net income of which (net income being made up of other income plus net operating revenues after operating expenses, which should include all taxes, income as well as local, and depreciation) has averaged for the preceding five years an amount at least twice the sum of rentals and net interest (i.e., after deducting interest charged to construction) and the sum of the amount included in operating expenses for depreciation and retirements, plus the surplus after the payment of cash dividends, has averaged for the same period at least 25 per cent of the net income.

Based on Wide Experience

The percentages I have given you were determined upon after careful analysis of the performance for the past five years of more than fifty companies. In this number were many different types, operating under varying conditions with respect to rates, character of load and territory served. Some combined a considerable gas with their electric business, some were wholesalers of power generated at low operating cost from hydro-electric developments of costly construction, a few were distributors of energy they did not generate, but purchased wholesale, and some were metropolitan central steam station properties embracing extensive underground and overhead distribution systems. For these reasons you will appreciate that it is dangerous to be dogmatic in prescribing a general formula, lest its usefulness be marred by rigidity. Yet I venture to assert

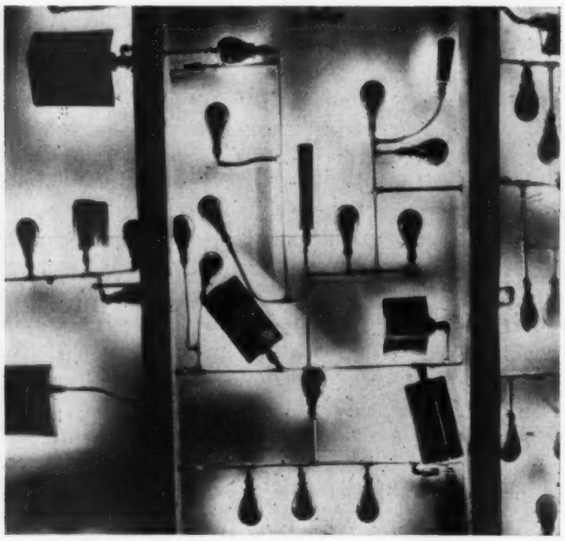
**From an address before the National Association of Mutual Savings Banks.*

that the requirements I have defined will prove sufficiently elastic and at the same time will safeguard investment.

Indication of Switch Positions Without Individual Lamps

By B. N. Merritt
Assistant Load Dispatcher
Pacific Gas & Electric Company, San Francisco, Calif.

THE system operating chart used in the load dispatcher's office of the Pacific Gas & Electric Company consists of ten sheets of 4x12-ft. No. 12 Armco black iron plate bolted to a framework made of vertical I-beams bolted to curved angle irons at top and bottom. Several priming coats were applied, and finally a finishing coat of flat gunmetal paint, mixed without oil to eliminate gloss.



Method of lighting switch-indicating lenses on dispatcher's operating chart

Switches are indicated by telephone switchboard lamp caps of two sizes. Holes for these caps were drilled in the iron plates before the board was assembled, their location being determined by the use of full-sized templates of heavy detail paper on which the system switching arrangement was laid out. The problem of lighting the caps was difficult. Due to lack of space behind the board floodlighting was impossible and the cost of placing individual lamps under each cap was considered prohibitive. Group lighting was found economical and effective, using specially made reflectors and various types of lamps placed on the back of the board.

Striping of different widths and various colors was used to represent transmission lines. The work was done by a professional sign painter, the outline for his work being laid out in advance with chalk. Standard coach colors mixed in kerosene gave a flat finish. Stations and switching points are inclosed in white outlines and various symbols are used to represent apparatus.

Lamp caps representing switches are in two colors, red and green, indicating closed and open switches respectively. The caps are changed by hand with a special tool to avoid marring the finish of the board by contact with the fingers. The caps fit tightly in the holes and no difficulty has been experienced in keeping them in place.

Rural-Line Construction

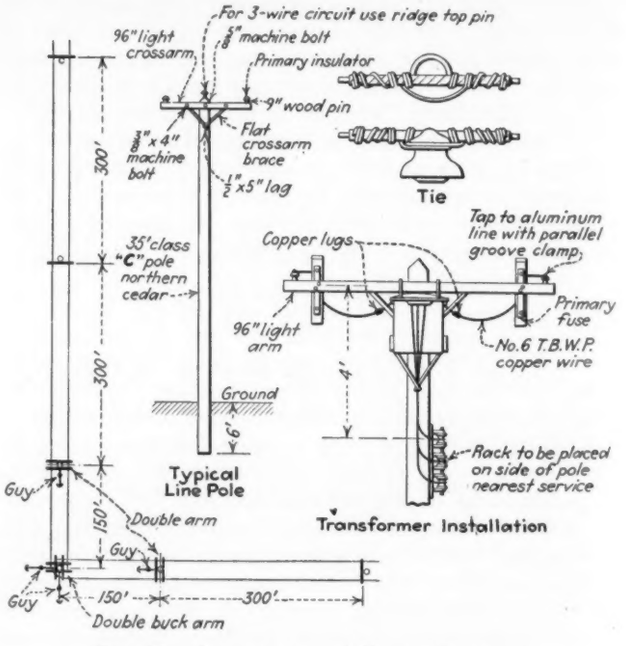
By H. P. Seelye
Distribution Engineering Department,
Detroit Edison Company, Detroit, Mich.

THE general practice of the Detroit Edison Company in making rural line extensions results in a construction that may be treated in contracts on the blanket basis of $1,000 per mile. This figure includes, in addition to the actual material and labor of construction, a reasonable allowance for tree trimming and the other variable factors usually encountered. Class "C" 35-ft. Northern cedar poles with an 8-ft. light crossarm are used. Poles are spaced normally 300 ft. apart. Only primaries are carried on the arm, usually two conductors, but if a third is required it is put on the pole top. Separate transformers are set for each customer and the secondary drops taken off a pole rack unless two services are within 300 ft. of each other. In this case an intermediate pole is set into the normal 300-ft. open span and the extended secondaries carried on racks.

SAGS FOR FOUR SPANS AT EIGHT TEMPERATURES

Spans	Temperatures, Deg. Fahr.					
(Ft.)	0	20	40	60	80	100
300	66	68	70	72	73	75
250	45	47	49	52	55	58
200	23	25	27	29	32	34
150	10	12	14	16	18	21

Both No. 2 and No. 4 steel-reinforced aluminum cable are used for primary conductors, a greater use being made of the No. 2. Insulator ties are of No. 6 soft-drawn aluminum, made as shown in the accompanying illustration, and armor is of aluminum tape. Transformer primary taps are made with parallel groove clamps. Except for the 150-ft. corner spans, which have sags about twice as great as those noted in the table, the sags are as given above.



Specifications for rural line extensions

New Features Embodied in

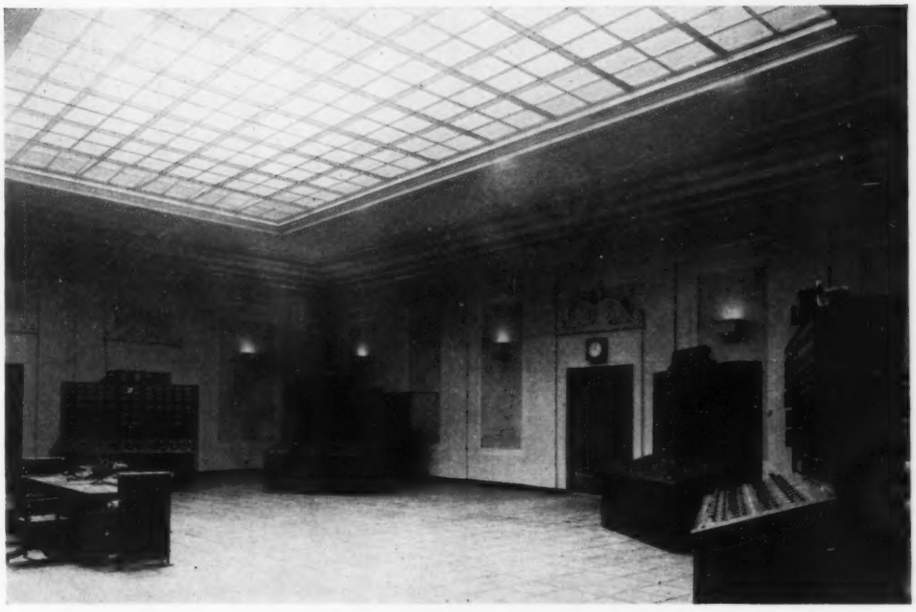
Century Receiving Substation

Unit station plan and bus segregation provide flexibility and reduce short-circuit currents. Many new ideas incorporated in the design

By C. P. GARMAN

Assistant Electrical Engineer Construction and Generation Division, Bureau of Power and Light, Los Angeles, Cal.

LOS ANGELES doubled its population in five years, and this increase presented some interesting problems in producing and distributing electricity. The Bureau of Power and Light realized early in its growth that some definite plan for the future was necessary to avoid unwise expenditures for property and apparatus that might rapidly become outgrown and dangerous to service. A careful survey of the future metropolitan area enabled the bureau to determine the probable population and demand to be served in the next twenty years. Many studies were made in this connection, all of which led up to a comprehensive plan to serve a metropolitan city of several million people with a class of service and reliability commensurate therewith.



Operating room in control house

All light enters through skylights from above, preventing reflection on instrument dials.

Briefly, this plan employs a number of receiving stations supplied from transmission lines controlled by synchronous condensers. Duplicate 132-kv. belt lines, to which each receiving station is connected, make all power sources equally available to any receiving station. At the receiving stations the voltage is reduced to 33 kv. for delivery to the distribution stations and large industrial consumers. These distribution stations, in turn, are interconnected by a 33-kv. network, where the voltage is further reduced for general city distribution.

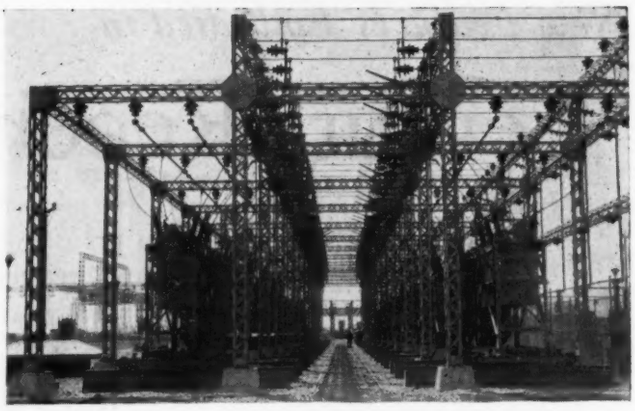
Due to the concentration of power in this metropolitan area, it was necessary to adopt a plan carefully worked out with respect to short-circuit currents. In order to limit these currents to reasonable values a system of loose coupling through reactors was employed. By advantageously placing these reactors the short-circuit duties were limited to 1,000,000 kva. in the 33-kv. distribution network, 1,500,000 and 2,000,000 kva., respectively, on the 33- and 132-kv. buses in the receiving stations and 4,000,000 kva. on the belt line. Each receiving station serves a definite district of the city through ten to fourteen distribution stations. They are similar with respect to their connections into high-voltage belt and distribution network.

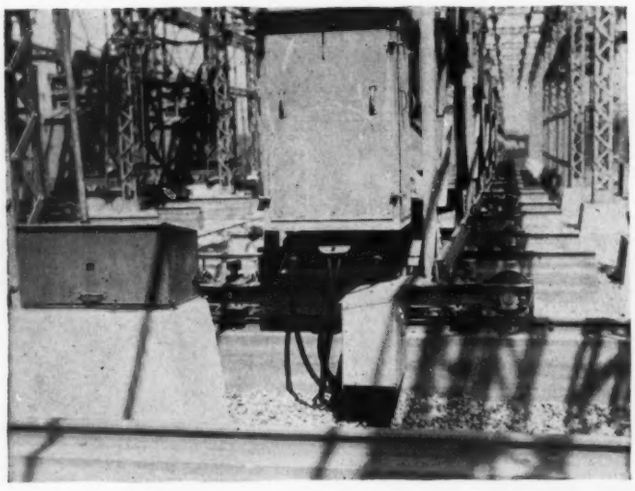
Century receiving station is typical of the receiving stations and has an ultimate capacity of 320,000 kva. It is situated in a rapidly growing industrial section of southeastern Los Angeles and is tied into the belt line by four 132-kv. circuits. The ultimate station comprises a control house, four 33-kv. and two 132-kv. outdoor switch racks. The four 33-kv. structures resulted from the segregation of the bus into four widely separated units tied together through reactors by an underground bus. Each 33-kv. bus section or unit is fed by a separate transformer bank from a common 132-kv. bus. This bus, in turn, is segregated into two sections connected through reactors, one of which may be regarded as the station bus serving the transformer banks and connected to the source of power, while the other acts as the belt line tie. The general plan of the substation is shown in the accompanying schematic diagram and airplane view.

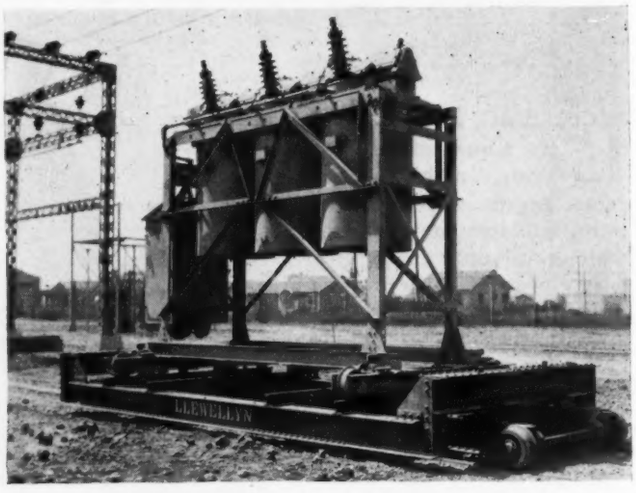
The completed station may then be viewed as four 80,000-kva. stations on the same premises tied together

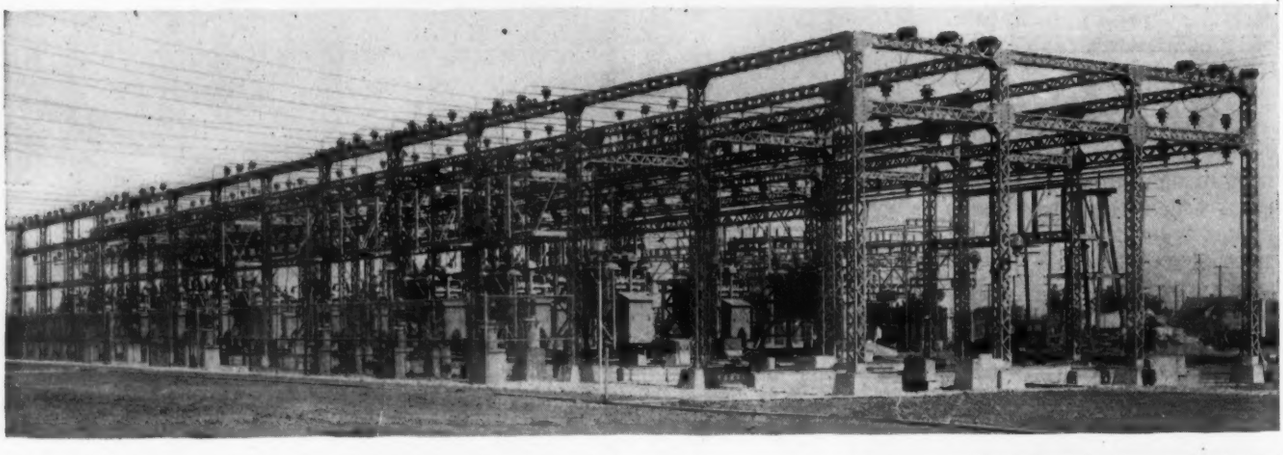
Sections of Los Angeles Receiving Station

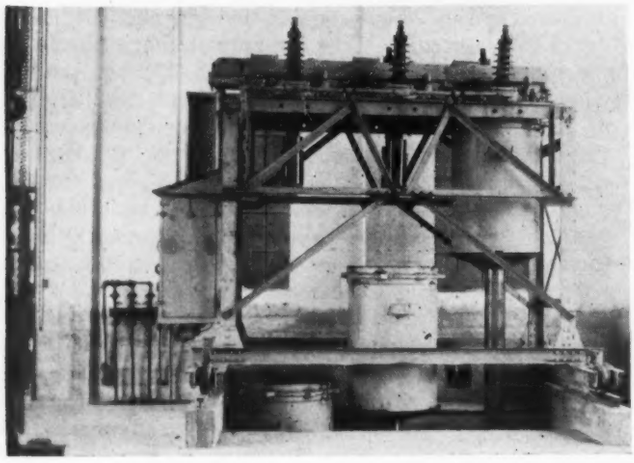
AMONG the views shown are those of the 33-kv. bus structure, control cable connections for the 33-kv. circuit breakers, the method of transporting oil circuit breakers to repair room, a general view of entire 33-kv. bus structure, a hydraulically operated circuit breaker tank-lowering device, and method of mounting 132-kv. circuit breakers. These are shown in the order named.

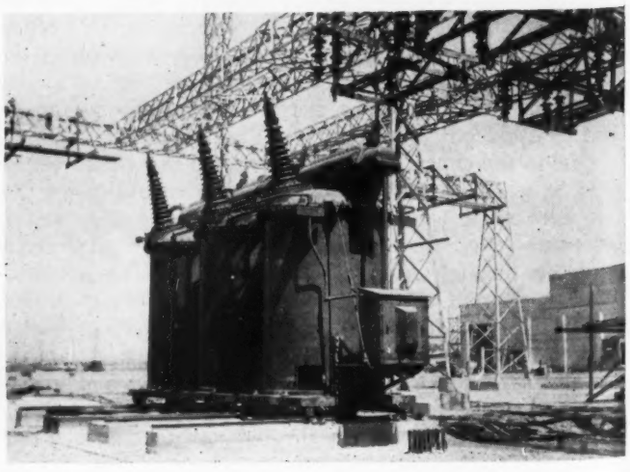












through reactors by a star connection of the 33-kv. buses and each supplied through transformer banks from a common high-tension bus. The design was the result of a number of important requirements which it was desired to incorporate in the station, foremost of which was the necessity to localize trouble, provide getaway for 40 33-kv. feeders and to supply unfailing service to the consumer. Construction costs were lowered by the design adopted because it led to standardization of structures and equipment. Engineering and drafting were also reduced. New construction may easily keep pace with expansion and at no time will it be necessary to build more than is required to care for the growth of the territory which this station serves.

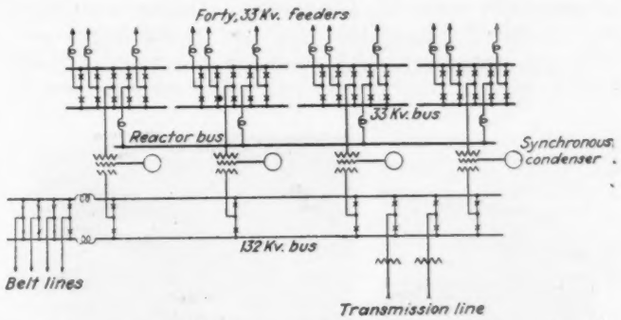
Due to the wide separation of structures required by this scheme, unusual distances were encountered between points of control. This required remotely controlled equipment throughout and the installation of relay panels adjacent to each bus section to avoid long current transformer leads.

Switchyard

The 132-kv. structure, like the 33-kv., is built around the unit plan and employs wide spacing for isolation of equipment. The overhead flexible bus used was the natural solution to the wide spacing because it required a minimum of steel and insulators for its support and permitted free passage around the high-voltage equipment. The buses are 750,000-circ.mil medium hard-drawn copper, supported at the ends by calibrated equalizing springs to maintain normal sag throughout the temperature range. The intermediate supports are suspended-unit type, pillar insulators, hinged to move in line with the bus but rigid against lateral movement. Concrete foundations for the structural steel are designed to serve also as manholes for duct lines.

The 33-kv. structures each provide for thirteen bays, divided into ten feeders, one transformer bank, one reactor bus junction and one spare oil circuit breaker position. These structures were designed of steel to be self-supporting and free of cross bracing and tie rods. They support rigid duplicate buses mounted on 66-kv. pin-type insulators. These insulators were standardized and used throughout on all 33-kv. construction. Space was provided adjacent to each 33-kv. bus section to accommodate the future installation of feeder reactors.

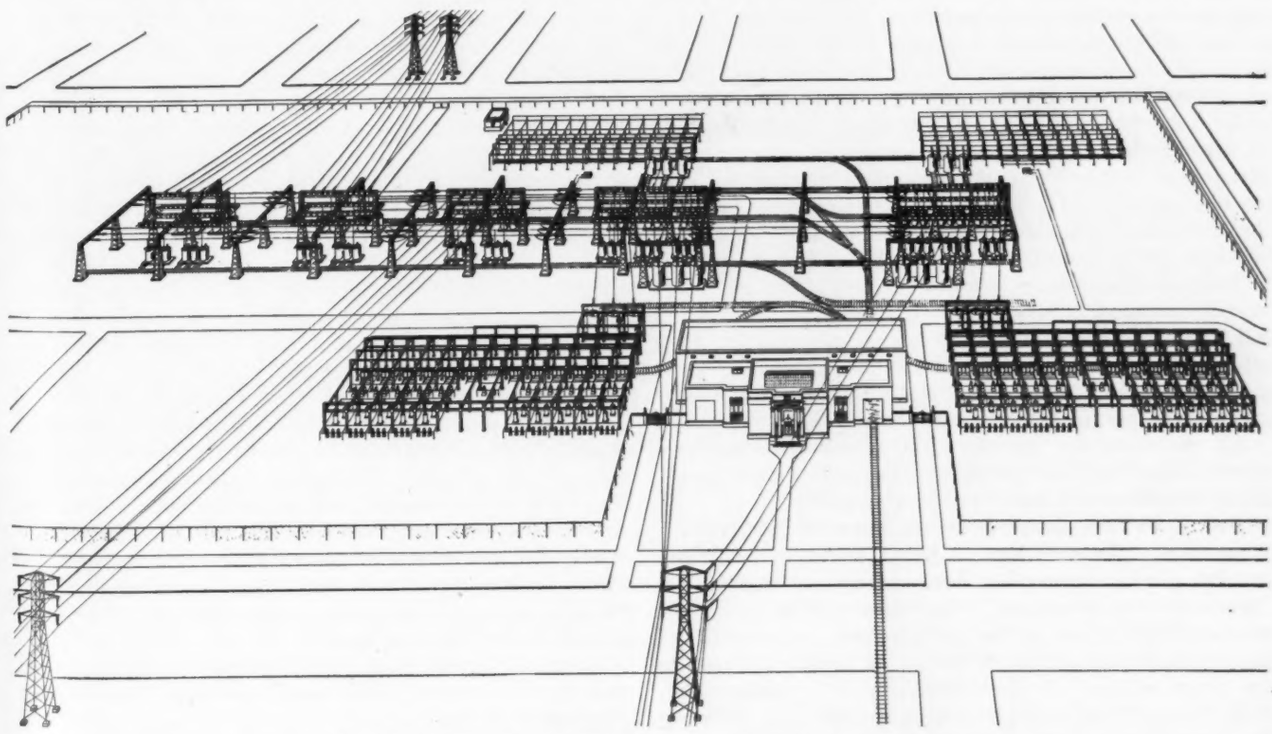
The yard is completely equipped with track to facilitate transportation of all heavy equipment from its location into the repair shop. An electric storage battery



Schematic diagram of typical receiving substation

truck equipped with flanged wheels serves as the motive power for moving heavy equipment.

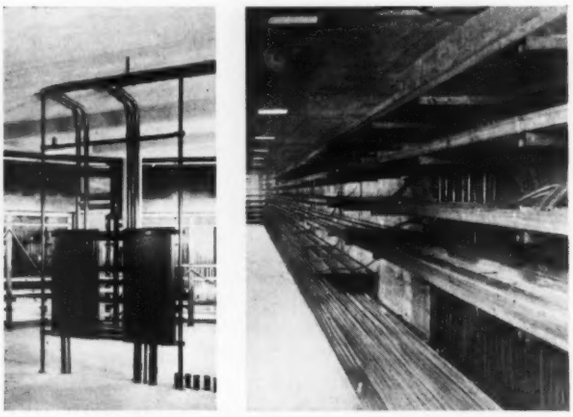
A searchlight and foam generator for fighting oil fires is also provided on this truck. Additional fire protection is obtained by a high-pressure water system with hydrants located at strategic points. This water supply is used in addition for washing insulators and outdoor equipment while in service. The ground area beneath each structure is properly drained and backfilled with coarse gravel. In case of fire these gravel beds will serve as an effective medium for quenching oil fires due to chilling and smothering effects. An oil depot located on the premises houses all oil handling equipment, together with three 12,000-gal. storage tanks. The yard is



Airplane view of ultimate Century receiving substation

equipped with a fill and return line to serve all large oil-filled apparatus.

Each of the four main transformer banks feeding a 33-kv. bus section consists of three single-phase, three-winding transformers. The rating of each bank is 80,000 kva. at 34,500 volts, 60,000 kva. at 132,000 volts and 60,000 kva. at 13,200 volts. The transformers are star connected on the 34.5-kv. and 132-kv. windings with their neutrals solidly grounded and are delta connected on the 13.2-kv. winding. Each transformer is self-cooled up to 70 per cent load, at which point auxiliary air blast is automatically applied. The tertiary winding is equipped with reduced voltage taps for use in starting a synchronous condenser. All bushings are equipped with bushing-type current transformers for relay protection.



Terminus of control cables and switchboard wiring, and tunnel showing cable trays

The neutral end of each winding is brought out of the tank through low-voltage bushings to establish a thorough ground, which at all times is subject to inspection and test.

Due to the tremendous weight of 204,000 lb. per transformer a special heavy-duty truck was required to facilitate transportation to the condenser room crane.

The 132-kv. oil circuit breakers on the transforming end of the high-tension bus have an interrupting capacity of 2,000,000 kva. and those to be used on the belt line end of the bus will be 4,000,000 kva. This difference in interrupting capacity of the two sets of oil circuit breakers is due to the contemplated installation of 132-kv. bus reactors. The present short-circuit duty justified the immediate installation of 2,000,000-kva. oil circuit breakers on the entire high-tension bus. System growth will dictate the future installation of the higher interrupting capacity breakers and current-limiting reactors. All bushings on the 132-kv. breakers are equipped with capacitance transformers for synchronizing and potential indication. Each unit of a three-pole breaker is truck-mounted to permit ready transportation.

All disconnecting switches are motor operated, remotely controlled and completely interlocked with the oil circuit breakers and line grounding switches.

The 33-kv. oil circuit breakers have an interrupting capacity of 1,750,000 kva. They are connected to the bus by quickly removable flexible jumpers and to the control system by a special tram-type coupler to permit easy removal. One of the outstanding features of the station is the portability of the 33-kv. breakers. Due to the large number of these breakers to be maintained, their size and their weight, the hydraulic tank-lowering device shown in one of the accompanying illustrations was installed in the repair room at the control house. The lowered maintenance cost has amply justified this device as well as the portable features of the breakers.

The control house, to a certain extent, was designed on the unit plan, hence is consistent with the scheme followed through the entire station. Due to architectural considerations and factors relating to growth, however, it was necessary to construct the first section complete. The initial structure consists of a two-story concrete building and basement. The basement accommodates all incoming control cables, terminal boards and station service equipment, and space has been provided for auxiliary equipment for four 60,000-kva. synchronous condensers. The first floor contains the repair room, two control battery rooms, toolroom, locker rooms, office and operating room. The operating room is unique in several ways, foremost of which is the interior decoration and method of illumination. All daylight and artificial light are transmitted through actinic glass from above. By this arrangement shadows and halation are entirely eliminated, thus producing a soft, uniform light over the entire control room. The second floor provides for spare parts storage and future supervisory control equipment. Future addition to the building for housing synchronous condensers may be added in part or entirety at the rear with no change in the existing structure.

Control Features

Due to the large number of control circuits involved and recognizing the advantages of flexibility and that rapid changes in the art of relay protection are taking place, it was found advisable to provide a more flexible means for handling cables than the ordinary conduit system. This led to the adoption of a system of tunnels equipped with galvanized iron trays in which all lead-covered control and instrument cables are laid. These tunnels, one of which is shown in an accompanying illustration, are constructed of reinforced concrete, waterproofed throughout, and extend from each 33-kv. bus section in the yard to the basement of the operating room. At the bus end an enlargement of the tunnel section creates a vault for housing relay panels serving the bus section adjacent thereto.

All control and instrument cables are lead-covered, multi-conductor, and terminate at both ends on standardized test panels. In the operating room basement these panels are mounted directly beneath the respective bench and meter boards to which they relate, the switchboard wiring itself being continuous down to this point. Relay cables are also terminated on test panels mounted back of the relay boards in the vaults above described. The points of testing are in this way clearly defined, thus obviating the loose practice of disturbing the switchboard wiring.

The combined bench and meter boards were designed on the unit plan, each bus section having its own control board. These boards are equipped with control switches that give a distinct visual and auditory indication in the event of automatic circuit-breaker operation. By this means the source of trouble can be detected instantly on the control board. Due to the unusual distances encountered and the large operating currents required by the circuit-breaker mechanism a 250-volt d.c. control voltage was adopted.

Provisions were made for duplicate storage batteries and the d.c. control buses were carefully sectionalized. Fuse switches and indicating lamps on each d.c. control bus were located on the d.c. control panels in the oper-

ating room. This concentration centralized the operation and testing of the complete control system. The station service is a 230-volt, three-phase, double bus arrangement and is controlled through magnetic switches from a panel in the operating room.

The system of grounds is of interest because of the extensive area covered. A copper network grounded at many points to driven wells was employed to maintain a low potential gradient throughout the station area. Means were provided for testing the conductivity of the wells separately or together with sections of the network. Each ground well consists of a 2-in. copper pipe driven to a depth of 90 ft., which is far below the minimum water level of this locality.

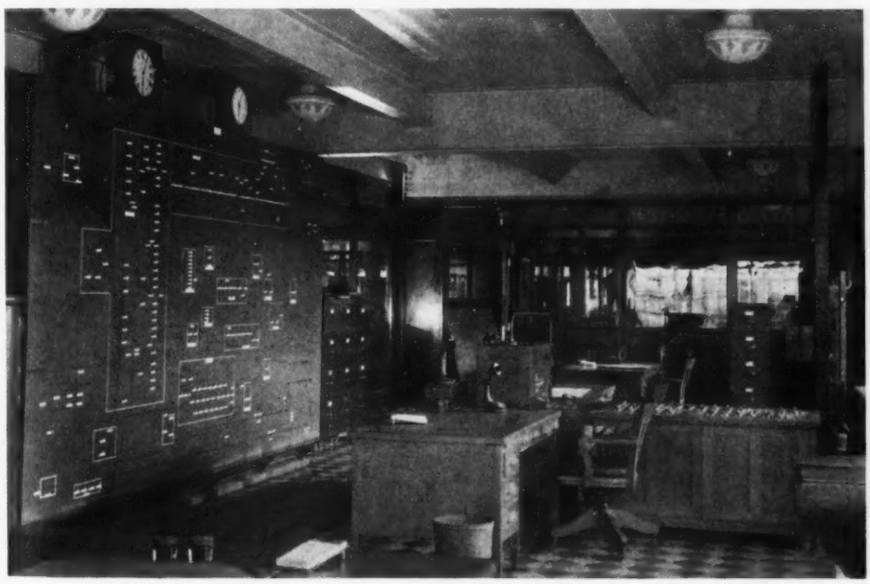
The unit design of this station has proved entirely satisfactory and a duplicate of it is now under construction in the Los Angeles harbor district.

Telltale Load Dispatcher Board

By W. S. Cronin and A. J. Davis*

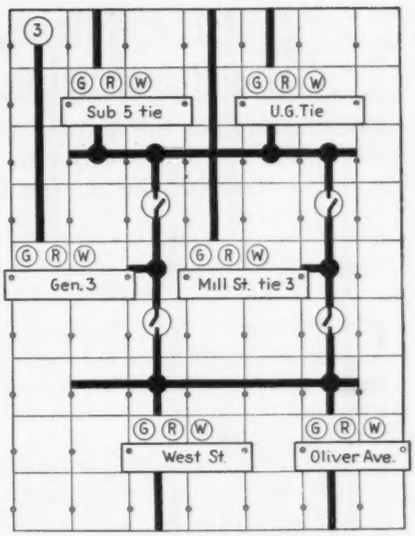
THE Indianapolis Power & Light Company has just put into operation what is believed to be the first fully telltale and interchangeable type of load dispatcher's board with desk control. This installation provides a one-line miniature low-voltage power system which sets up by means of certain circuit arrangements of control keys and lamp signals the results of all switching operations on the system.

The board consists of fifteen panels measuring 2½ ft. high by 2⅔ ft. long, mounted three panels high and five panels horizontally. Each panel is drilled and tapped for mounting 960 one-inch square escutcheons which may be blank, embossed to represent circuits or support signals as required. One, two or three miniature switchboard lamps may be assembled back of each symbol escutcheon. The lamp jacks or escutcheon plates may be moved about in a checker fashion to care for changes and additions.



Unit type dispatcher's board and control desk

Embossed blanks are used to make the painting of the circuit diagram a simple and accurate job, as the embossing prevents the paint from running or spreading over the surface of the escutcheon. The finish of this board is dark green "Duco." In drawing the one-line diagram red oil paint is used on the 33-kv. lines, orange on the 4,100-volt circuits and blue on the 2,300-volt circuits. Embossed plates may be removed, the colored lines erased and changed without injury to the background finish.



Replaceable sections bearing lines or signal lenses facilitate alterations of board

The lamp signal unit used to represent each disconnect and air-break switch consists of a lamp-jack assembly that holds one red and one green miniature switchboard lamp, mounted so the tips of both lamps meet directly behind molded glass lens. The circuit is such that the signal must be either red or green except in the case of circuit interruption, when the signal is dark.

A three-lamp signal is used to distinguish the oil switches from "disconnects" and "air-breaks" indicating when a circuit is "held off."

Clear miniature lamps are mounted behind red, green and white jewels. A long sleeve-type of lamp cap prevents cross-lighting between signals. The red and green signals have the customary meaning, while the white one indicates "hold off." When none of the three lamps is lighted it is an indication that the line, bus or feeder is "dead."

Any signal may be connected with any control key at the operator's desk by shifting jumpers or cross-connecting wires on the rear of the board. The keys used to control the "disconnect" and "air-break" symbols are of the pull-twist type. Control keys for the oil switch signals are of the three-position lever type that requires the operator to pull out the lever to effect its movement.

All signals are normally energized from a 24-volt alternating-current supply, but relays automatically connect the signals to a direct-current supply in case of alternating-current failure.

The equipment was designed, manufactured and installed by the Leich Electric Company, Genoa, Ill.

*Superintendent of operation and chief load dispatcher, respectively, Indianapolis Power & Light Company, Indianapolis, Ind.

Price Cutting and the Purchasing Agent

Price cutting not the cause of profitless prosperity. Purchasing agent cannot know seller's costs. Overproduction the fault

By Herbert Ashton

Assistant Purchasing Agent J. G. White Engineering Corporation, New York

CONSIDERABLE discussion has developed recently concerning the present so-called profitless prosperity. Suggestions have been offered as to its causes and remedies and the attempt has been made to place the blame for this situation largely on the practice of price cutting. A considerable proportion of the responsibility for this price cutting has been placed on the purchasing agent. In fact, a whole series of cases has been built up to show how wicked he has been and is. To this the writer wishes to make strenuous objection. That there have been instances of purchasing agents using unethical practices in taking advantage of a competitive market is undeniable, but what of the multiplicity of forms of commercial bribery and proselyting practiced continually by salesmen? For every instance cited of unethical buying a half dozen cases of immoral sales methods can be produced. The very act of price cutting itself is essentially an unethical sales practice. In every purchase or sale it is not only ethical but the duty of the buyer, and the seller too, to get everything he can, honestly, for his employer. If the seller takes an order at a loss it is not the buyer's fault, some opinion to the contrary notwithstanding; it is the seller's fault. This has been rightly termed sales cowardice. And it is just as cowardly to saddle the responsibility on the purchasing agent.

Purchaser Cannot Know Sales Costs

To say that the purchasing agent should know his seller's costs and should not accept a price that will net his supplier a loss is simply shutting one's eyes to realities. For any one article that a purchasing agent has to buy there are an average of at least a half dozen sellers. And the average purchasing agent has literally hundreds of articles to buy. It is obviously beyond the realm of human capability to expect him to know how much it costs any particular one of these numerous manufacturers to produce his particular article or articles, even if the manufacturer would let him. The purchasing agent can't do it. It is up to the seller himself to watch his own ledgers. It is not the duty of the purchasing agent to protect the weak or poorly managed units in an industry. And to blame him for a situation like the present, which has its causes in the fundamentals of industrial economics, is giving him credit for vastly more power than the average purchasing agent has any right to dream of.

With regard to unethical practices and the need for higher standards, let me quote from the statements of several manufacturers:

"You can take a pure young man and make him a purchasing agent today and before Sunday the manufacturer's salesman will have taught him all the dirty tricks in the business."

"Most manufacturers are hard losers and are more or less jealous of their competitors and will take the business at less than their costs merely to keep their competitors from receiving it."

"When volume is slightly below the standard, then any orders secured at a price above primary costs help pay expense."

"Remember the purchasing agent in a seller's market does not dare ask, 'Is this your best price?' The sales agent insults easily."

Almost every conceivable variety of crutch has been recommended for the seller in the effort to take away from the buyer his present temporary advantage and substitute collusion for open competition. It is recommended that every bidder should know what every other bidder has bid and "post-mortems on competitive bids should be made standard practice among all electrical manufacturers so that losers may analyze all bids and understand their lost business. This is lawful and already is being done to some extent, the exchange of bids being made by bidders." Let us be grateful indeed that we still have a Federal Trade Commission, and let us hope that it will not cease to function. It seems evident from the last sentence quoted above that this government body will have to be called on to limit the measures that are to be taken not only to deprive the purchasing agent of any temporary market advantages but of his only protection against unscrupulous sales methods. It would seem that the only thing left for the purchasing agent to do for his own protection is to form a like combination of buyers.

Price Cutting Not a New Development

Let us look at realities with regard to price cutting. That it is an immediate factor in our "profitless prosperity" there can be no doubt. But to call it *the* cause is simply overlooking a long train of circumstances which have led up to a condition different in degree only from perfectly normal practices. Price cutting is not a new or sudden development. It has been with us for a long time. It had its origin in the distant past, and has been used as a means of securing or holding favored clients for generations.

Whenever productive capacity has been developed beyond economic requirements in an industry or group of industries price cutting is bound to result until the weaker units are forced out of existence or merged with the stronger organizations. This was true of the period of greatest development of the railroads; it was true in the period of expansion in the steel industry (in the early days of trusts); it was true also during the period of greatest growth in the oil industry, and the fact that it exists in the electrical industry today is simply another instance of productive development beyond normal consumptive capacity.

Price cutting is not a cause, much less *the* cause, of profitless prosperity. It is the result of a series of economic factors, which in turn have developed largely in consequence of the war. During the period of hostilities industries were so encouraged to expand by the very abnormal demand for all commodities that when peace came there had grown up an army of industrial giants capable of a vastly greater output than there was any possible normal demand for. But there had been a great capital outlay, and it was important that some return on this capital be made, however small. This meant that volume production must be maintained. Since there was not sufficient normal demand, and there hardly could be, with the nations of the world in various degrees of impoverishment, it became necessary to stimulate demand by various means. Price cutting has been one method resorted to, but it is not the only one. Advertising on a

large scale has been a factor of very considerable importance.

The complexity and artificiality of our economic structure has been greatly increased by the new social *mores* engendered through advertising campaigns and "high-powered" salesmanship. I refer to the greatly increased consumption of articles of commerce which come generally under the head of luxuries. And this has had its effect on practically all forms of industry. But because we have had a war and whole nations are in debt, and because, therefore, the present normal demand for goods is not in keeping with the present capacity to produce them, it has meant a sacrifice to bring the rate of consumption to a point more in keeping with the rate of production. This sacrifice has taken the form of lowered prices. It is also felt in the cost of advertising, and in general sales costs. In other words, the cost of marketing goods increases as the ratio of supply to normal demand increases and competition becomes more and more severe. This is essentially the situation as it is today, and it is a little like trying to make the tail wag the dog to blame it on price cutting. The attempt to place the responsibility on the purchasing agent is totally unwarranted.

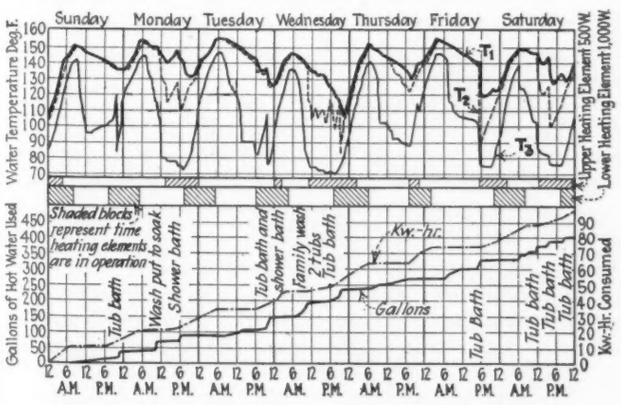
Semi-Off-Peak Storage Water Heating

By L. A. Williams
Engineer Hynes & Cox Electric Corporation

IN ORDER to develop the night-time or off-peak load considerable work has been done on off-peak water heating. This is very easily accomplished for the small user's average requirements, but there are times, such as on laundry days, when the hot water requirements may be double that of ordinary days, and it is at these times that the straight storage system falls down.

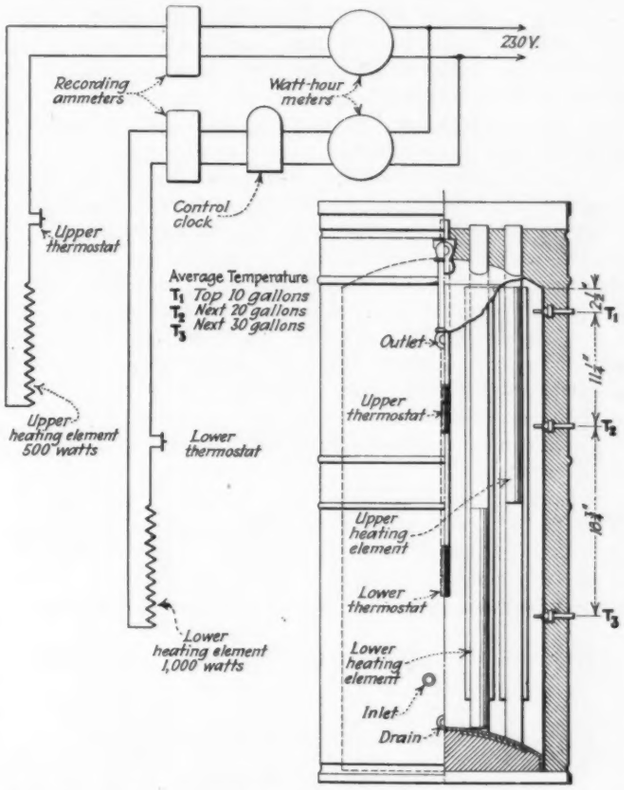
If hot water service is to be sold to the customer it is necessary either to install an auxiliary heater which can be turned on in the day time or a storage tank having a capacity large enough to meet this occasional heavy demand. If the auxiliary heater is used it means an added initial expense and a certain amount of bother to the customer, and if a large storage tank is used both the initial expense and the operating expense are increased, the latter due to heavy radiation losses from the larger tank.

The following test was run in order to find out what could be accomplished by using a tank approximately equal to the average daily hot water requirements, having a very low day-time demand and a comparatively low night-time demand.



Performance of 60-gal., 1½-kw. water heater

The average daily consumption of hot water was 57 gal., the weekly hot water consumption 400 gal. and the weekly power consumption 97 kw.-hr. From 7 p.m. to 7 a.m. 86 kw.-hr. was consumed and from 7 a.m. to 7 p.m. only 11 kw.-hr. The incoming water was 55 deg. F. Both the upper and lower heater elements were under thermostatic control, but the lower one (1,000 watts) also had time clock control. Temperatures T_1, T_2 and T_3 were taken at the points shown in the other illustration.



Position of thermostatic controls in semi-off-peak storage water heater and hook-up for performance test

A 60-gal. storage water heater was equipped with two heating elements, located in different positions in the tank, which were controlled by two thermostats, also located in different positions in the tank, as shown in the accompanying illustration. The lower heating element, rated at 1,000 watts, together with its controlling thermostat, was located at the bottom of the tank and was controlled by a time clock set to turn the circuit on at 7 p.m. and cut it off at 7 a.m. The other heating element, rated at 500 watts, together with its controlling thermostat, was located at the top of the tank and was connected directly across the line so that it would operate independently of the time clock. Its function was to prevent the water temperature at the top of the tank from falling below a certain fixed limit, which would otherwise happen when hot water requirements were very heavy. When the water temperature at the top of the tank fell to approximately 135 deg. F. the thermostat automatically turned this heating element on and cut it off again when the water temperature had been raised to 150 deg. F. Due to the location of this element and thermostat it was only required to heat a comparatively small body of water through a small range of temperature, so that the boosting effect was very rapid.

As shown in the wiring diagrams, the power consumption of each heating element was measured by kilowatt-

hour meters and the periods of heating by recording ammeters. Water temperatures were measured by means of a three-pen recording thermometer, the bulbs of which were inserted through the side walls of the tank at three points, indicated by T_1, T_2 and T_3 in the scale drawing. Water consumption was measured by means of a water meter inserted in the cold water supply to the heater. From the readings obtained from these instruments the curve was plotted for a one week's run, which shows the water temperatures at all times, the hot water consumption in gallons and the kilowatt-hour consumption. The black blocks represent the time that each of the heating elements was in operation.

It will be noted from the curves that the water temperature T_1 (which represents the temperature of the water supplied to the faucets) was approximately 150 deg. F. each morning, falling during the day as water was used, but only once falling below 118 deg. F., which was at 10 p.m. on Wednesday, at the conclusion of a day when 80 gal. of hot water was used, but this drop was of no consequence, since hot water was not again needed until the following morning.

This test shows that by the use of semi-off-peak it is possible to maintain an ample supply of hot water to the user and at the same time to consume a very large proportion of the load at off-peak times. It was found in this week's run that 86 kw.-hr. was used on the night-time load between 7 p.m. and 7 a.m. and only 11 kw.-hr. on the day-time load, between 7 a.m. and 7 p.m. This is equivalent to approximately 88 per cent of night-time load.

Due to the flexibility of this arrangement practically any rating of heating elements can be used to meet special conditions, and if so desired the upper heating element may be placed on a separate meter and controlled by a manual control switch, leaving it to the user's discretion whether he wishes to pay the small extra charge for continuous hot water service or whether he wishes to make out with the stored hot water only.

Cost of Feed-Water Equipment for Eastern Station

FROM the construction cost records of an Eastern central station are taken the accompanying data bearing upon a plant extension carried out during 1925 in connection with feed-water equipment. These figures represent field costs in place, with major overheads excluded. The latter should, of course, be added, with contractor's compensation, in making estimates.

Feed-water Heaters with Condensate Pumps	
One 4,000-sq.ft., three-pass Elliott straight tube heater condenser with motor-driven condensate pump.	
One 2,000-sq.ft. bleeder heater, eighth stage, four-pass straight tube Griscom Russell complete with 2-V port valve drainage traps	$28,093
Water Softener	
One Cochrane 80,000-gal.-per-hour deäerating water softener, type T, complete with two horizontal filters 8 ft. diameter x 30 ft. long, and one sedimentation tank 25 ft. diameter x 22 ft. high, complete with 3,000-g.p.m. pump driven by 50-hp. G.E. motor	39,891
Boiler Feed Pumps	
One 1,000-gal.-per-minute six-stage DeLaval pump complete with motor and control.	
One five-stage Cameron pump, same capacity, with motor and control.	
Two 1,000-gal.-per-minute single-stage Bethlehem weir pumps complete with turbine drives	29,429
Booster Pumps	
Two 1,000-gal.-per-minute centrifugal pumps, DeLaval single-stage, direct connected to two 40-hp. Westinghouse motors	4,055
Meters, Controls, Regulators, etc.	
Two 16-in. type M Venturi meters, 4-in. throat diameter; four Mercon feed line pressure regulators; ten 4-in. Stets boiler feed controls, type B; four Simplex boiler feed meter registers; four 6-in. x 3½-in. Venturi tubes; four Bristol remote indicators (electric), and two 3-in. x 1½-in. Venturi tubes	17,103
One 60,000-lb. set of two measuring tanks, 2 ft. 7 in. x 15 ft., and 2 ft. 8 in. x 15 ft.	4,493

Inside Rooms Made Cheerful by Electric Windows

WITH the concentration of many people in restricted areas and in large buildings such as are found in Chicago and other cities there are numerous cases where employees must face blind walls day in and day out in rooms that are without windows. There are also many cases where restaurants and salesrooms are located below the street level and consequently are wholly without daylight. There is a natural desire on the part of every one to be able to see out of doors. As a matter of fact, there are cases in Chicago where employees are paid a bonus for working in basements where there is no daylight.

Electric windows installed in basement and inside rooms

In order to correct or alleviate this situation electrically E. O. Schweitzer, chief testing engineer of the Commonwealth Edison Company, has designed a portable electric window which may be sold complete ready to plug in to a convenience outlet. The accompanying illustration shows the naturalness of these windows and the impression of the proximity of outdoor atmosphere which is created. A number of these windows have already been installed in a basement room of the Utilities Security Company and also in inside rooms in the Edison Building in Chicago. The windows are equipped with 500 to 1,000-watt incandescent lamps, depending upon the surface area.

It has been found that basement restaurants and salesrooms can be made highly attractive to the public and to the workers therein and that the depressing shut-in atmosphere which pervades many such places has been entirely eliminated.

Well-Balanced Sales Program

Analysis of the new-business accomplishments of Doherty subsidiaries shows simultaneous development of new loads and customers and increased business from existing customers

THE records of commercial accomplishments by the electric utilities of Henry L. Doherty & Company for 1927 present an example of the results which may be obtained through a well-balanced sales organization. A study of the various sales records made by the new-business departments of these companies shows that their activities have not only covered a wide field but that in so doing no important possibility for the development of new load and revenue has been overlooked or slighted. These activities covered sales of securities, the promoting of rural extensions, conducting of lighting schools, cooking and electric range demonstrations, home service work and the introduction of new rate schedules, all of which contributed to the maintenance and improvement of relations between the companies and their customers.

Analysis of the strictly electrical business—merchandising, lighting and power sales—brings out some interesting relations between new-business effort and its effect upon increased energy consumption and gross annual revenue. The total electric appliance and installation sales during 1927 were $5,626,008 and the total average number of customers served during the year was 368,927. Thus the average amount of merchandise sold per customer was $15.25. The amounts varied for different localities, as shown in the accompanying table giving the names of the companies, number of sales divisions operated, sales per customer, average number of customers and total sales by each. The latter figure does not include the sale of $297,588 of industrial equipment by the power sales departments. The three leading companies in sales per customer were the Bartlesville Gas & Electric Company, whose average sales per customer were $39.01; the Durham Public Service Company, $37.53, and the Ohio Public Service Company, $20.16.

TABLE I—MAJOR ELECTRICAL APPLIANCE SALES DURING 1927

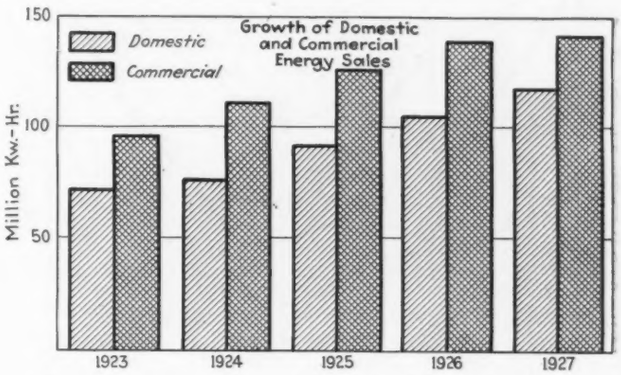
811	Ranges	7,437	Portable lamps
5,691	Sweepers	3,465	Waffle irons
5,235	Washers	1,477	Heating pads
15,737	Irons	1,965	Room heaters
773	Ironers	3,503	Percolators
4,232	Toasters	1,773	Grills
2,147	Fans	321	Signs
1,847	Kitchen fixtures	5,937	Ice machines
5,017	Commercial fixtures	1,967	Curling irons
4,431	Domestic fixtures	2,223	Battery eliminators
3,208	Radio sets	660	Battery chargers
500	Fireless cookers		

TABLE II—AMOUNT OF ELECTRICAL APPLIANCE SALES AND SALES PER CUSTOMER

Company	No. of Sales Divisions Operated	Sales per Customer	Average No. of Customers	Total Electrical Appliance and Installation Sales
Bartlesville Gas & Electric Co.	1	$39.01	4,510	$175,713
Durham Public Service Co.	1	37.53	8,125	306,235
Ohio Public Service Co.	9	20.16	72,100	1,453,358
Citizens Light & Power Co.	1	18.88	4,375	94,753
Bristol Gas & Electric Co.	1	18.30	5,464	99,383
Toledo Edison Co.	3	18.05	92,538	1,580,370
Danbury & Bethel Gas & Electric Light Co.	1	16.83	7,889	132,329
Empire District Electric Co.	1	14.64	24,839	361,290
St. Joseph Ry., Lt., Ht. & Pwr. Co.	1	10.06	24,768	245,522
Public Service Co. of Colorado	4	9.65	118,956	1,148,979
City Light & Traction Co.	1	5.21	5,363	28,076
Total	24	$15.25	368,927	$5,626,008

Balanced Effort

A list of the total number of major electrical appliances sold during the year is given in Table I. Among the outstanding activities has been the work of the different new-business departments in selling electric refrigeration, electric ranges, radio sets, commercial and domestic lighting fixtures and development of farm electrification. Companies have been particularly active in electric refrigeration sales, which have been consistently pushed throughout the year rather than during the most favorable seasons. The sale of 14,431 domestic lighting fixtures was the result of a number of refixturing campaigns conducted on the various properties. A total of 811 electric ranges were sold and plans have been made for more intensive development of this load with the accompanying appliance, the electric water heater.



Growth of domestic and commercial energy sales, 1923 to 1927

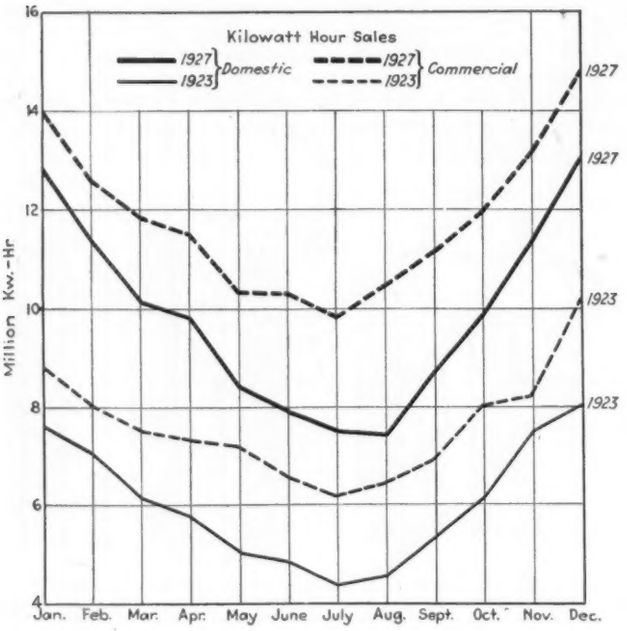
The effect of these merchandise and installation sales upon energy consumption is quite apparent. During 1927 the number of electric customers increased 4.9 per cent over the year previous. At the same time the sale of energy to domestic and commercial users increased 10.8 per cent. In other words, the gain in energy consumption has been more than twice as rapid as the increase in consumers, showing that the work of building up the load among existing customers is being carried on successfully.

All of the Doherty electric utilities reported good increases, averaging 10 per cent, in the sale of energy to their residential customers. In a number of instances these increases were more than 20 per cent. Several of the companies reported sales to this class of consumer in excess of 400 kw.-hr. per year and a few reached a total

of 500 kw.-hr. per year. The accompanying chart of total domestic and commercial energy sales for the last five years shows that during that period domestic sales have increased 63.7 per cent and commercial sales 55.1 per cent.

Industrial Power Load

A total of 75,609 hp. in new and additional motor installations was added to the lines of the companies during the year. Of these installations 33,504 hp., or 43 per cent, went into the plants of new customers and 41,845 hp., or 55.7 per cent, was additional load in the plants of existing customers. This ratio again indicates that the power sales branch of the new-business departments is



Domestic and commercial energy sales by months, 1923 to 1927

also successfully carrying out the policy of developing load among existing users.

Further analysis of the added industrial load shows that it will consume in excess of 100,000,000 kw.-hr. annually and return a gross annual revenue of $1,920,198, or an average of $33.88 per kilowatt. This revenue per kilowatt of course varies with the locality and nature of loads served. The annual gross revenue from the business contracted for by each power salesman averaged $87,281. This also varied for different companies, depending largely on the nature of the territory served.

A study of the accompanying charts and tables shows that in the development of new loads and additional business the Doherty subsidiaries have followed a well-balanced sales program. While ample attention has been given to taking on new customers and extending service into new areas a preponderance of sales effort has been placed on increasing existing classes of business and the loads of present customers. The aim of such a policy of business development is to increase the load factor of generating plants and systems, thus increasing the utilization of the capital invested and increasing the rate of capital turnover. The results for the year 1927 indicate that this is being accomplished, and the same policies are being carried out even more intensively this year.

TABLE III—DOMESTIC AND COMMERCIAL ENERGY SALES—1923 TO 1927

	Domestic Kw.-Hr.	Commercia Kw.-Hr.
1923	72,482,188	91,869,572
1924	75,990,821	110,741,075
1925	91,157,322	125,792,585
1926	104,573,632	139,428,427
1927	118,678,896	142,405,806
Per cent increase 1923 to 1927	63.7	55.1

Comparative Lighting Costs

IF FOOD costs an unskilled worker four hours of labor every day, how long does he have to work to light his home correctly?

Dr. M. Luckiesh, director of the lighting research laboratory at Nela Park, after an extensive survey into comparative lighting costs, has answered the question, one answer being the result of actual fact and the other a figure derived from scientific analysis.

The average unskilled laborer of today, earning $3.20 per day, spends only 7 cents of this for lighting his home, or, in terms of labor, only about ten minutes. Contrast this with the laborer of 1879, whose average wage was $1.43. If the laborer of that day used as much light as he does now, it would have cost him 44 cents in cash outlay, or 2½ hours of work! The contrast is even more striking when one realizes the decreased value of the dollar today.

The average family now spends less than 7 cents a day for electric lighting. To enjoy convenient and utilitarian lighting it should spend three times as much. The convenience, utility and psychological value of good home lighting may be bought for extra expenditures equal to the price of a daily ice cream soda!

Dr. Luckiesh says that this is also true with people whose incomes aggregate many thousands of dollars per year, the cost of correct lighting requiring only a fraction of a second of work. It is readily seen that in the future the education work in lighting should not only show how to use artificial light but also to place it in its proper place in the scale of costs and values.

Table IV—Analysis of New Power Load Contracted For in 1927

Company	Number of Power Salesmen	Equipment Sales	Horsepower New	Connected Additional	Motor Load Total	Estimated Increased Annual Revenue	Annual Revenue per Kw.	Added Revenue per Power Salesman
Empire District Electric Co.	4	.....	6,520	16,008	22,528	$749,700	$44.32	$187,425
Ohio Public Service Co.	8	$122,627	10,888	17,672	28,560	429,285	20.12	53,660
Toledo Edison Co.	4	97,943	5,761	4,512	10,273	378,340	49.20	94,582
Public Service Co. of Colorado	4	34,701	10,335	1,498	11,833	314,573	35.48	78,643
St. Joseph Ry., Lt., Ht. & Pwr. Co.	1	30,802	.....	1,606	1,606	32,120	26.66	32,120
Citizens Light & Power Co.	1	11,515	.....	549	809	16,180	26.66	16,180
Totals and averages	22	$297,588	33,504	41,845	75,609	$1,920,198	$33.88	$87,281

Consolidation Reduced Rates

Interconnection of transmission systems in Georgia made possible many rate reductions. Power available to industry in any part of the state in any desirable amount

A LARGE part of the state of Georgia is now served by the Georgia Power Company, which is a unit of the recently formed Southeastern Power & Light Company's system. The Georgia Power Company and its subsidiary operating companies have extended service to many communities in the state of Georgia and have brought to the support of each of the cities they serve engineering, financial and business talent and resources which could not possibly be provided by a small company or by the municipal plants which previously served the communities in the larger portion of the territory. By reason of the affiliation of the Georgia Power Company with the Southeastern Power & Light Company there has been placed at the disposal of the utility in Georgia an efficient and effective organization for the purpose of assisting in the agricultural and industrial development of the state and direct work is being done to bring into the state industries which can locate in any desirable community and be assured of an adequate power supply at the same rate that may be obtained in larger cities.

Rate Reductions Follow Interconnection

An interesting analysis is available of the effect of the extension of the interconnected Georgia Power Company's system on the cost of electric service to customers in the smaller towns of the state. In 1925 J. Prince Webster, formerly rate expert of the Georgia Public Service Commission, made a compilation of electric light and power rates in all cities in Georgia of 1,000 population and over. This compilation showed the net amount paid in each municipality by the residence lighting customers using respectively 25, 50 and 100 kw.-hr. per month, by commercial lighting customers using respectively 100 and 1,000 kw.-hr. per month and by retail power customers using respectively 100, 500, 1,000 and 5,000 kw.-hr. per month and the average rate for each of these classes of service.

On Jan. 1, 1928, the Georgia Power Company served 74 cities and municipalities in addition to those served by its constituent companies as of April 1, 1926, when the Southeastern Power & Light Company became interested in the Georgia situation. Of these 74 additional cities and municipalities, 28 had no electric service previously. Of the remaining 46, 22 had a population of 1,000 and over, and of these 22, sixteen were previously served by municipally owned steam plants and six by privately owned isolated plants or systems.

The rates in effect in the 22 municipalities of 1,000 population at the time Mr. Webster made his survey were still in effect at the time the Georgia Power Company or its constituent companies took over the 22 municipalities, with two exceptions, in which cases the rates in effect were slightly increased. A comparison of the rates in effect in the sixteen cities served by municipally owned steam plants and in the six cities served by isolated privately owned plants at the time they were taken over by the Georgia Power Company or its constituent companies with the rates now charged for the practically unlimited continuous 24-hour service supplied by the Georgia Power Company shows a reduction of from 21 per cent to 59 per cent in residence lighting rate, a reduction of from 13 per cent to 42 per cent in commercial lighting rates and a reduction of from 2 per cent to 76 per cent in retail power rates. These com-

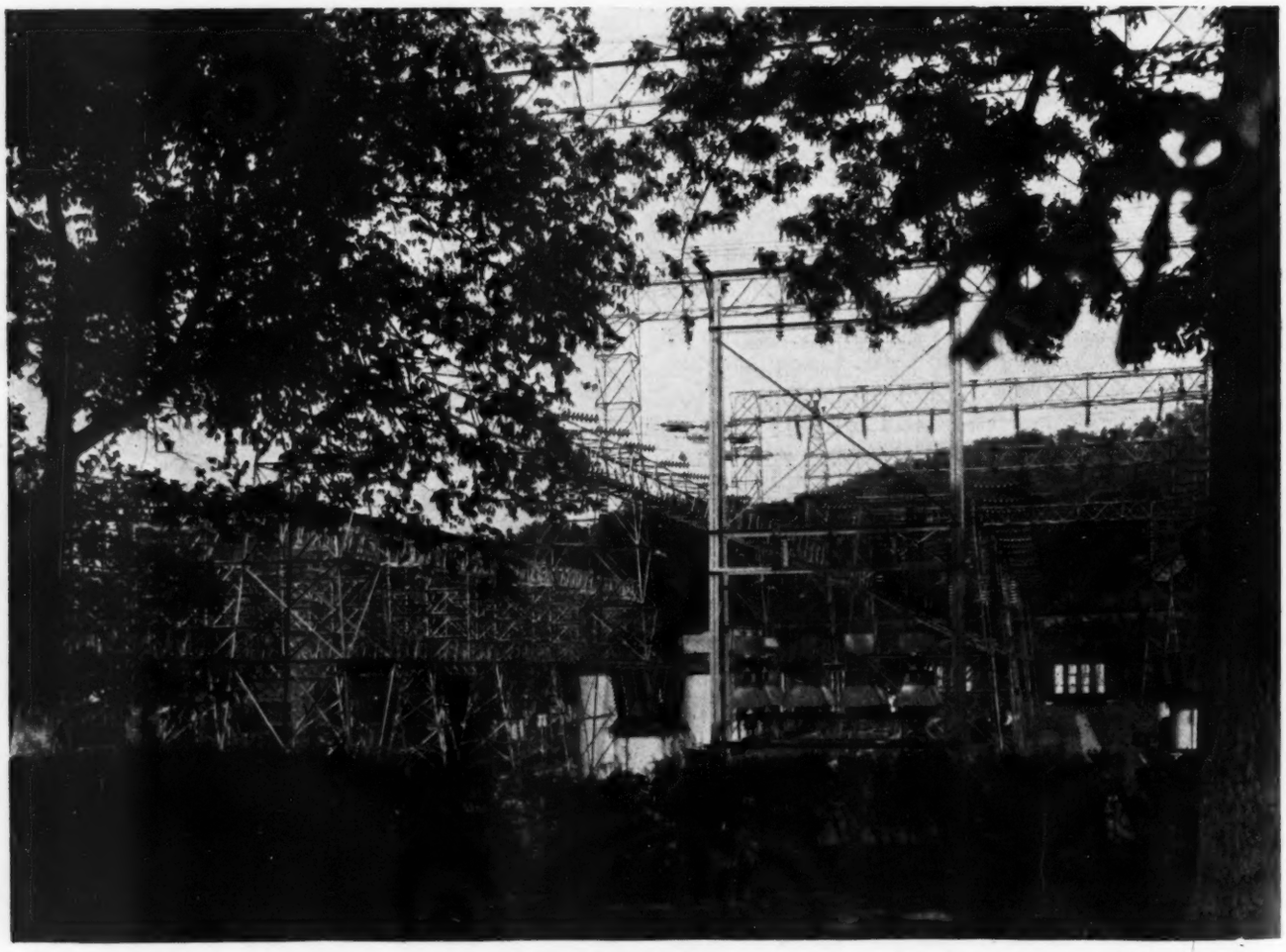
Table I—Decrease in Residence Lighting Rates

In sixteen Georgia cities of 1,000 population and over compared to rates formerly charged by municipally owned steam plants.

Energy Consumed per Customer per Month in Residence Lighting

	Population		Kw.-Hr. 25	Kw.-Hr. 50	Kw.-Hr. 100	Average Rate, Cents	Decrease Per Cent.
Baxley	1,142	Old rate	$3.75	$7.50	$15.00	15.00	.....
		Present rate	2.70	4.00	6.00	7.26	.....
		Decrease	$1.05	$3.50	$9.00	7.74	51.60
Bowdon	1,047	Old rate	$3.75	$7.50	$15.00	15.00	.....
		Present rate	2.40	3.40	4.90	6.11	.....
		Decrease	$1.35	$4.10	$10.10	8.89	59.27
Claxton	1,265	Old rate	$3.75	$7.50	$15.00	15.00	.....
		Present rate	2.70	4.00	6.00	7.26	.....
		Decrease	$1.05	$3.50	$9.00	7.74	51.60
Douglasville	2,159	Old rate	$3.13	$6.25	$11.25	11.79	.....
		Present rate	2.48	4.95	9.90	9.90	.....
		Decrease	$0.65	$1.30	$1.35	1.89	16.03
Dublin	7,707	Old rate	$3.00	$6.00	$12.00	12.00	.....
		Present rate	2.70	4.00	6.00	7.26	.....
		Decrease	$0.30	$2.00	$6.00	4.74	39.50
Greensboro	2,128	Old rate	$4.25	$8.00	$14.25	15.14	
		Present rate	2.48	4.95	9.90	9.90	.....
		Decrease	$1.05	$3.50	$9.00	7.74	51.60
McRae	1,273	Old rate	$4.16	$8.00	$14.17	15.05	.....
		Present rate	2.70	4.00	6.00	7.26	.....
		Decrease	$1.46	$4.00	$8.17	7.79	51.76
Soperton	1,933	Old rate	$3.75	$7.50	$15.00	5.00	.....
		Present rate	2.70	4.00	6.00	7.26	.....
		Decrease	$1.05	$3.50	$9.00	7.74	51.60
Sparta	1,895	Old rate	$4.25	$8.00	$15.50	15.86	.....
		Present rate	2.70	4.00	6.00	7.26	.....
		Decrease	$1.55	$4.00	$9.50	8.60	54.23
Statesboro	3,807	Old rate	$4.00	$8.00	$16.00	6.00	.....
		Present rate	3.15	6.30	12.60	12.60	.....
		Decrease	$0.85	$1.70	$3.40	3.40	21.26
Swainsboro	1,578	Old rate	$3.75	$7.50	$15.00	15.00	.....
		Present rate	2.70	4.00	6.00	7.26	.....
		Decrease	$1.05	$3.50	$9.00	7.74	51.60
Tallapoosa	2,719	Old rate	$2.50	$4.68	$8.25	8.81	.....
		Present rate	2.40	3.40	4.90	6.11	.....
		Decrease	$0.10	$1.28	$3.35	2.70	51.60
Vidalia	2,860	Old rate	$3.38	$6.75	$13.50	13.50	.....
		Present rate	2.70	4.09	6.00	7.26	.....
		Decrease	$0.68	$2.75	$7.50	6.24	46.22
Wadley	1,423	Old rate	$3.75	$6.75	$13.50	13.72	.....
		Present rate	2.70	4.00	6.00	7.26	.....
		Decrease	1.05	2.75	7.50	6.46	47.08
Wrightsville	1,476	Old rate	$4.25	$8.00	$15.50	15.86	.....
		Present rate	2.70	4.00	6.00	7.26	.....
		Decrease	$1.55	$4.00	$9.50	8.60	54.22

Tugalo is rated at 88,000 hp. and has a 140-ft. dam impounding 500,000,000 cu.ft. of water



110,000-volt supply is stepped down for local service at this substation in Atlanta

parisons are shown in the accompanying tables, based upon (1) a decrease in residence lighting rate in sixteen cities of 1,000 population and over compared to rates formerly charged by municipally owned plants: (2) a decrease in the commercial lighting rates in these cities; (3) a decrease in the retail power rates in these cities; (4) a decrease in the residence lighting rates of six cities of 1,000 population and over compared to rates formerly charged by privately owned isolated plants; (5) a decrease in the commercial lighting rates of these cities; (6) a decrease in the retail power rates in these cities.

There have been similar reductions in rates in practically every one of the 46 other cities and municipalities now served by the Georgia Power Company and its constituent companies since the Southeastern Power & Light Company became interested in the Georgia Power Company in April, 1926. These 46 cities are exclusive of the additional 28 towns added to this system where previously there had been no electric service and are also exclusive of the cities of Rome and Athens.

In addition to the very material reduction in rates above referred to and as shown in the accompanying tables, the consolidated Georgia Power Company supplies to each of these small communities the same type and character of service that is supplied to the larger cities. Each community has behind it the load-building, commercial, engineering and financial resources of the Georgia Power Company, as well as its affiliated Southeastern Power & Light Company, and each of these cities is thereby enabled to solicit the location of industries on the assumption of an adequate supply of power at the same rates as may be obtained in larger cities, and each of these communities has working for it the load-building and new-business organization of the Georgia Power Company and its affiliated system.

Table II—Decrease in Commercial Lighting Rates

In sixteen Georgia cities of 1,000 population and over compared to rates formerly charged by municipally owned steam plants.

Energy Consumed per Customer per Month in Commercial Lighting

	Population		Kw.-Hr. 100	Kw.-Hr. 1,000	Average Rate, Cents	Decrease, Per Cent
Baxley	1,152	Old rate	$15.00	$150.00	15.00	.....
		Present rate	12.00	82.95	8.63	.....
		Decrease	$3.00	$67.05	6.37	42.46
Bowdon	1,047	Old rate	$15.00	$150.00	15.00	.....
		Present rate	9.90	72.90	7.53	.....
		Decrease	$5.10	$77.10	7.47	49.80
Claxton	1,265	Old rate	$12.99	$125.49	12.58	.....
		Present rate	12.00	82.95	8.63	.....
		Decrease	$0.99	$42.54	3.95	31.40
Douglasville	2,159	Old rate	$11.25	$101.25	10.23	.....
		Present rate	9.90	72.90	7.53	.....
		Decrease	$1.35	$28.35	2.70	26.39
Dublin	7,707	Old rate	$12.00	$100.00	10.18	.....
		Present rate	12.00	82.95	8.63	.....
		Decrease	0	17.05	1.55	15.23
Greensboro	2,128	Old rate	$14.25	$100.00	10.39	.....
		Present rate	9.90	72.90	7.53	.....
		Decrease	$4.35	$27.10	2.86	27.52
Hazlehurst	1,383	Old rate	$15.00	$150.00	15.00	.....
		Present rate	12.00	82.95	8.63	.....
		Decrease	$3.00	$67.05	6.37	42.47
McRae	1,273	Old rate	$14.17	$95.84	10.00	.....
		Present rate	12.00	82.95	8.63	.....
		Decrease	$2.17	$12.89	1.37	13.70
Soperton	1,033	Old rate	$15.00	$150.00	15.00	.....
		Present rate	12.00	82.95	8.63	.....
		Decrease	$3.00	$67.05	6.37	42.47
Sparta	1,895	Old rate	$15.50	$110.50	11.45	.....
		Present rate	12.00	82.95	8.63	.....
		Decrease	$3.50	$27.55	2.82	24.63
Statesboro	3,807	Old rate	$16.00	$100.00	10.55	.....
		Present rate	12.00	82.95	8.63	.....
		Decrease	$4.00	$17.05	1.92	18.20
Swainsboro	1,578	Old rate	$15.00	$150.00	15.00	.....
		Present rate	12.00	82.95	8.63	.....
		Decrease	$3.00	$67.05	6.37	42.47
Tallapoosa	2,719	Old rate	$8.25	$82.50	8.25	.....
		Present rate	9.90	72.90	7.53	.....
		Decrease	*$1.65	$9.60	0.72	8.73
Vidalia	2,860	Old rate	$13.50	$131.50	13.18	.....
		Present rate	12.00	82.95	8.63	.....
		Decrease	$1.50	$48.55	4.55	34.52
Wadley	1,423	Old rate	$13.50	$67.50	7.36	.....
		Present rate	12.00	82.95	8.63	.....
		Decrease	$1.50	*$15.45	*1.27	*17.25
Wrightsville	1,476	Old rate	$15.00	$150.00	15.00	.....
		Present rate	12.00	82.95	8.63	.....
		Decrease	$3.00	$67.05	6.37	42.47

*Increase.

Table III—Decrease in Retail Power Rates

In sixteen Georgia cities of 1,000 population and over compared to rates formerly charged by municipally owned steam plants.

Energy Consumed per Customer per Month in Retail Power

	Population		Kw.-Hr. 100	500	1,000	5,000	Average Rate, Cents	Decrease, Per Cent
Baxley	1,152	Old rate	$15.00	$75.00	$150.00	$750.00	15.00	.....
		Present rate	5.40	23.40	42.53	164.03	3.57	.....
		Decrease	$9.60	$51.69	$107.47	$585.97	11.43	7620.
Bowdon	1,047	Old rate	$15.00	$75.00	$150.00	$750.00	15.00	.....
		Present rate	5.40	23.40	42.53	164.03	3.57	.....
		Decrease	$9.60	$51.60	$107.47	$585.97	11.43	76.20
Claxton	1,265	Old rate	$13.00	$63.00	$125.50	$625.50	12.53	.....
		Present rate	5.40	23.40	42.53	164.03	3.57	.....
		Decrease	$7.60	$39.60	$82.97	$461.47	8.96	71.51
Douglasville	2,159	Old rate	$11.25	$51.25	$101.25	$501.25	10.08	.....
		Present rate	5.40	23.40	42.53	164.03	3.57	.....
		Decrease	$5.85	$27.85	$58.72	$337.22	6.51	64.58
Dublin	7,707	Old rate	$10.00	$32.50	$47.50	$150.00	3.64	.....
		Present rate	5.40	23.40	42.53	164.03	3.57	.....
		Decrease	$4.60	$9.10	$4.97	$14.03	0.07	1.92
Greensboro	2,128	Old rate	$8.75	$40.75	$81.50	$200.75	5.03	.....
		Present rate	5.40	23.40	42.53	164.03	3.57	.....
		Decrease	$3.35	$17.35	$38.97	$36.72	1.46	29.03
Hazlehurst	1,383	Old rate	$15.00	$75.00	$150.00	$750.00	15.00	.....
		Present rate	5.40	23.40	42.53	164.03	3.57	.....
		Decrease	$9.60	$51.60	$107.47	$585.97	11.43	76.20
McRae	1,273	Old rate	$25.00	$25.00	$50.00	$250.00	5.30	.....
		Present rate	5.40	23.40	42.53	164.03	3.57	.....
		Decrease	$19.60	$1.60	$7.47	$85.97	1.73	32.64
Soperton	1,933	Old rate	$15.00	$75.00	$150.00	$750.00	15.00	.....
		Present rate	5.40	23.40	42.53	164.03	3.57	.....
		Decrease	$9.60	$51.60	$107.47	$585.97	11.43	76.20
Sparta	1,895	Old rate	$15.50	$60.50	$110.50	$510.50	10.50	.....
		Present rate	5.40	23.40	42.53	164.03	3.57	.....
		Decrease	$10.10	$37.10	$67.97	$346.47	6.99	66.19
Statesboro	3,807	Old rate	$10.00	$42.50	$45.50	$200.00	4.52	.....
		Present rate	5.40	23.40	42.53	164.03	3.57	.....
		Decrease	$4.60	$19.10	$2.97	$35.97	0.95	21.02
Swainsboro	1,578	Old rate	$15.00	$75.00	$150.00	$750.00	15.00	.....
		Present rate	5.40	23.40	42.53	164.03	3.57	.....
		Decrease	$9.60	$51.60	$107.47	$585.97	11.43	76.20
Tallapoosa	2,719	Old rate	$6.00	$26.00	$47.25	$182.25	3.96	.....
		Present rate	5.40	23.40	42.53	163.03	3.57	.....
		Decrease	$0.60	$2.60	$4.72	$18.22	0.39	9.85
Vidalia	2,860	Old rate	$13.50	$30.00	$57.00	$177.00	4.21	.....
		Present rate	5.40	23.40	42.53	164.03	3.57	.....
		Decrease	$8.10	$6.60	$14.47	$12.97	0.64	15.20
Wadley	1,423	Old rate	$13.50	$37.50	$67.50	$307.50	6.46	.....
		Present rate	5.40	23.40	42.53	164.03	3.57	.....
		Decrease	$8.10	$14.10	$24.97	$143.47	2.89	44.74
Wrightsville	1,476	Old rate	$15.00	$75.00	$150.00	$750.00	15.00	.....
		Present rate	5.40	23.40	42.53	164.03	3.57	.....
		Decrease	$9.60	$51.60	$107.47	$585.97	11.43	76.20

Table IV—Decrease in Commercial Lighting Rates

In six Georgia cities of 1,000 population and over compared to rates formerly charged by privately owned isolated plants.

Energy Consumed per Customer per Month in Commercial Lighting

	Population		Kw.-Hr. 100	Kw.-Hr. 1,000	Average Rate, Cents	Decrease, Per Cent
Eastman....	2,707	Old rate....	$3.60	$7.20 14.40	14.40	.....
		Present rate..	12.00	82.96	8.63	.....
		Decrease.....	$2.40	$61.04	5.77	40.07
Eatonton....	2,519	Old rate.....	$12.50	$125.00	12.50	.....
		Present rate..	12.00	82.96	8.63	.....
		Decrease.....	$0.50	$42.04	3.87	30.96
McDonough.	1,263	Old rate.....	$15.00	$107.50	11.13	.....
		Present rate..	9.90	72.90	7.53	.....
		Decrease.....	$5.10	$34.60	3.60	32.34
Milledgeville	4,619	Old rate.....	$12.60	$94.50	9.74	.....
		Present rate..	12.00	82.96	8.63	.....
		Decrease....	$0.60	$11.54	1.11	11.40
Tennille.....	1,768	Old rate.....	$15.00	$123.00	12.55	.....
		Present rate..	12.00	82.96	8.63	.....
		Decrease.....	$3.00	$40.04	3.92	31.24
Villa Rica...	1,047	Old rate.....	$13.50	$126.00	12.68	.....
		Present rate..	12.00	82.96	8.63	.....
		Decrease.....	$1.50	$43.04	4.05	31.94

Table V—Decrease in Retail Power Rates

In six Georgia cities of 1,000 population and over compared to rates formerly charged by privately owned isolated plants.

Energy Consumed per Customer per Month in Retail Power

	Population		Kw.-Hr. 100	500	1,000	5,000	Average Rate, Cents	Decrease, Per Cent
Eastman..	2,707	Old rate....	$9.00	$40.97	$75.94	$285.72	6.23	.....
		Present rate.	5.40	23.40	42.53	164.03	3.57	.....
		Decrease....	$3.60	$17.57	$33.41	$121.69	2.66	42.69
Eatonton..	2,519	Old rate....	$8.00	$33.50	$59.50	$222.50	4.90	.....
		Present rate.	5.40	23.40	42.53	164.03	3.57	.....
		Decrease....	$2.60	$10.10	$16.97	$58.47	1.33	27.14
McDonough	1,263	Old rate....	$7.50	$26.50	$46.50	$206.50	4.35	
		Present rate.	5.40	23.40	42.53	164.03	3.57	.....
		Decrease....	$2.10	$3.10	$3.97	$42.47	0.78	17.93
Milledge-	4,619	Old rate....	$7.20	$30.60	$53.10	$170.00	3.95	.....
ville		Present rate.	5.40	23.40	42.53	164.03	3.57	.....
		Decrease....	$1.80	$7.20	$10.57	$5.97	0.38	9.62
Tennille...	1,768	Old rate....	$10.00	$37.50	$50.00	$200.00	4.51	.....
		Present rate.	5.40	23.40	42.53	164.03	3.57	.....
		Decrease....	$4.60	$14.10	$7.47	$35.97	0.94	20.84
Villa Rica.	1,047	Old rate....	No day current		No power customers			
		Present rate.	$5.40	$23.40	$42.53	$164.03	3.57	.....

The consolidation and consequent interconnected power resources likewise make possible the decentralization of industry in the state of Georgia, tend to prevent the overcrowding and congesting of cities and bring to the smaller cities and villages the opportunity for industrial advancement which has heretofore been enjoyed only by the larger cities. If a new industry locates in a small city it immediately brings decided benefits to the property owners within the town and to the farmers in the surrounding territory who supply the foodstuffs for the city and its industrial workers. The interconnected system in Georgia is bringing industries much closer to the farms, is benefiting industry itself and is benefiting the territory by increasing the payroll of the small town, furnishing employment to the people in that territory and furnishing a market for the products of the farm. The remarkable growth of Georgia along industrial lines is due largely to the expansion and development of electric power through interconnections.

Table VI—Decrease in Residence Lighting Rates

In six Georgia cities of 1,000 population and over compared to rates formerly charged by privately owned isolated plants.

Energy Consumed per Customer per Month in Residence Lighting

	Population		Kw.-Hr. 25	50	100	Average Rate, Cents	Decrease, Per Cent
Eastman...	2,707	Old rate.....	$3.60	$7.20	$14.40	14.40	.....
		Present rate..	2.70	4.00	6.00	7.26	.....
		Decrease.....	$0.90	$3.20	$8.40	7.14	49.58
Eatonton...	2,519	Old rate.....	$3.13	$6.25	$12.50	12.50	.....
		Present rate..	2.70	4.00	6.00	7.26	.....
		Decrease.....	$0.43	$2.25	$6.50	5.24	41.92
McDonough	1,263	Old rate.....	$3.75	$7.50	$15.00	15.00	.....
		Present rate..	2.40	3.40	4.90	6.11	.....
		Decrease.....	$1.35	$4.10	$10.10	8.89	59.26
Milledgeville	4,619	Old rate.....	$3.15	$6.30	$12.00	12.26	.....
		Present rate..	2.70	4.00	6.00	7.26	.....
		Decrease.....	$0.45	$2.30	$6.00	5.00	40.78
Tennille....	1,768	Old rate.....	$4.50	$8.00	$15.00	15.71	.....
		Present rate..	2.70	4.00	6.00	7.26	....
		Decrease.....	$1.80	$4.00	$9.00	8.45	53.78
Villa Rica..	1,047	Old rate.....	$4.12	$7.25	$13.50	14.21	.....
		Present rate..	2.50	5.00	10.00	10.00	.....
		Decrease.....	$1.62	$2.25	$3.50	4.21	29.63

Proves Proper Lighting Arrests Attention

WINDOW lighting without glass, featured at a recent show by the Fitchburg Gas & Electric Light Company, proved a relatively inexpensive and effective method of calling the attention of local merchants to the possibilities of high-intensity illumination. Artificial windows 8 ft. x 12 ft. x 9 ft. in size were built of Bristol board and each was equipped with 42 200-watt lamps and reflectors. The display also featured the falling off in interest which occurs in inadequately lighted store windows on cloudy days. Merchandise selling for higher prices than the normal lines exhibited was sold effectively through being shown under these favorable conditions and a decided stimulus given to local window lighting betterment. A demonstration show window illuminated by artificial light is illustrated above.

Display used to test drawing power of artificial light

Energy Cost Is Small Item in Manufacturing

THE extent to which the cost of electrical energy enters into the value of the product of certain major industries has been investigated by the Duquesne Light Company of Pittsburgh, Pa. The results of the study are shown in the accompanying table.

RATIO OF POWER COST TO VALUE OF PRODUCTS

Character of Product	Power Purchased 1925	Ratio Total Power Cost, Including Generated, to Gross Sales 1925
Ore reduction	$277,184	18.3
Oxygen and hydrogen	18,195	12.5
Tool manufacturer	12,640	4.00
Planing mill	4,276	4.00
Tool steel	42,340	2.75
Steel foundry and machine shop	49,692	2.24
Steel fabrication	8,603	1.8
Steel fabrication	13,227	1.3
Rolling mill—special shapes	42,623	1.13
Mining supplies manufacturer	1,558	0.92
Finishing mill	22,356	0.46
Enameling	13,515	0.41
Paint manufacturer	3,025	0.21

Letters from Our Readers

Utility Requirements of a Publicity Man

To the Editor of the ELECTRICAL WORLD:

It is evident from the Federal Trade Commission hearings that the public utility industry needs a new type of publicity agent. The publicity work heretofore has apparently been left largely in the hands of hired professional press agents who know little of the industry for which they speak. Their methods, it would seem, have often too closely followed those of the ballyhoo artists.

Publicity, to be effective and constructive in this sophisticated age, must be sincere, instructive and interesting. The public may be impressed for the time being with vainglorious and pompous talks, but on sober second thought it will discount them and ultimately reject them. On the other hand, plain-spoken yet interesting talks, based on facts and not fancies, and presented in a dignified and genial manner, will both entertain and convince an audience and will make lasting friends.

A good publicity man, therefore, should be more than a press agent versed solely in the art of advertising, journalism and publicity methods, and he should be more than the corporation lawyer type concerned too much with the mere technical legality of company activities, but ignoring public psychology. He should be a man of high-grade executive type—sincere, friendly and cultured. He should know his company and his public. His experience, training and knowledge should cover many phases of utility work, as engineering, operation, commercial and financial. Especially should he be well grounded in the economics of public utilities, in order that he can discuss intelligently with business men and others costs, rates and other economic phases of the public utility business.

I submit that the best publicity man might well be an engineer who, experienced in many of the lines indicated above, is also mentally equipped to study and master the fundamentals and chief features of those lines in which he lacks experience. Added to this, of course, he should have a definite talent for writing and for public speaking. Such a man might well be termed a "public relations engineer."

E. A. VAN DEUSEN.
Central Hudson Gas & Electric Company,
Poughkeepsie, N. Y.

Computing Compensator Settings for Voltage Regulators

To the Editor of the ELECTRICAL WORLD:

I have noticed some articles entitled "Computing Compensator Settings for Voltage Regulators," by V. W. Palen, in the ELECTRICAL WORLD. I note that his method of computing the impedance of two branches of a circuit connected in series is to add the impedance values of the combined sections. In the article appearing in the June 2 issue the errors introduced are very small, probably because the ratios of resistance and reactance are very nearly the same in the two combined sections. However, if the ratios of resistance and reactance are different in the combined sections, a very serious error in impedance will be introduced. Inasmuch as the computations given are in the nature of examples, I feel it would be advisable to correct the wrong impression which these articles might create in the minds of some of your readers.

In the article in the July 23 issue I notice that loop 1 is said to have a resistance drop of 5.50 volts, a reactance drop of 8.90 volts and an impedance drop of 12.10 volts. There is no way of verifying the values of resistance and reactance, or the manner in which the impedance drop is determined, but by combining the resistance and reactance drops in accordance with the customary law, which is $(IZ)^2 = (IR)^2 + (IX)^2$, the value obtained is 10.46 volts.

Inasmuch as the impedance values are not required for the compensator setting, it is unfortunate that these mistakes should have been introduced. Even though the mistakes are in immaterial points, they raise doubts in the reader's mind and detract from a useful series of articles. I trust that you will correct these mistakes and point out that when the impedance values are eliminated the remainder of the articles are complete and form a useful addition to the literature on the subject.

JOHN R. DUNBAR,
Electrical Engineer.
Canadian Westinghouse Company,
Hamilton, Canada.

To the Editor of the ELECTRICAL WORLD:

In going over the manuscript which appeared in ELECTRICAL WORLD under the title "Computing Compensator Settings for Voltage Regulators," I find that a serious error has been introduced in all of the illustrative problems where the circuit embraced some 350,000-circ.mil cable. This was due to an error in the table labeled "Characteristics of Unit Lengths of Conductors" which accompanied the first article of the series. In that table the figures for the impedance for 350,000-circ.mil cable should have been 0.0505 instead of 0.0580.

Substituting this value in the calculations for the double loop circuit (third article of series), the values for loop 1 become:

Resistance drop (AC) = 5.50 volts
Reactance drop (AC) = 8.90 volts
Impedance drop (AC) = 10.52 volts

These results fulfill the requirements of the law:

$$(IR)^2 + (IX)^2 = (IZ)^2$$

I am sorry that this error got by me in this series of articles, but trust that an announcement will help to straighten things out.

VERNON W. PALEN.
Long Island City.

Digest of Electrical Literature

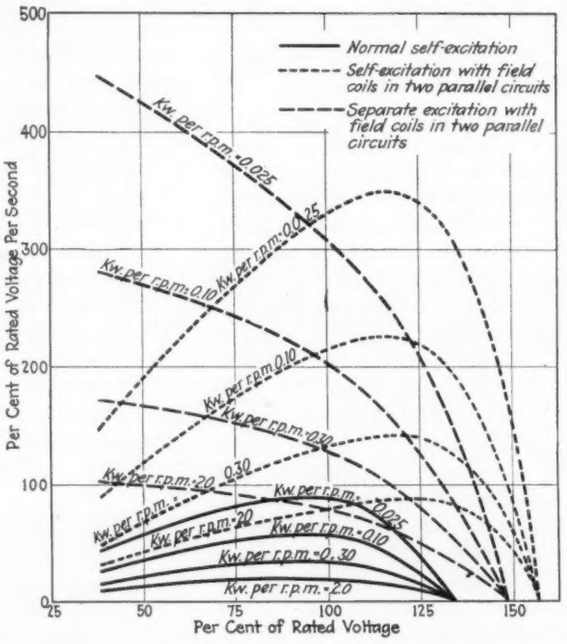
Hydro-Electric Development and Steam Equipment

Embrittlement of Boiler Plate.—SAMUEL W. PARR and FREDERICK G. STRAUB.—An investigation of the embrittlement phenomena of boiler plate has been undertaken by the authors, with particular reference to the characteristics exhibited by specimens obtained from equipment which has failed in service but with supplementary laboratory determinations and a consideration of the theoretical practices involved. Among the conclusions reached are: Embrittlement of boiler plate is caused by the combined action of stress and chemical attack; the stresses are inherent in the construction and operation of the boiler, while the chemical attack is caused by the presence of sodium hydroxide in the boiler water; certain methods of water treatment tend to convert some safe waters into the characteristic type which produces embrittlement; the presence of sodium sulphate in the feed water tends to retard the embrittling effect of sodium carbonate feed waters and if in proper proportions will stop entirely; the presence of phosphates, tannates, chromates, acetates, etc., will also inhibit the embrittling action of caustic soda if these salts are present in the boiler water in proper proportions; methods for the introduction of these inhibiting agents to feed waters have been worked out and are in operation in large power plants, and no steel suitable for boiler plate has been found which is resistant to the embrittling action of caustic soda.—*University of Illinois Bulletin,* June 5, 1928.

Generation, Control, Switching and Protection

Superimposed High-Frequency Currents for Circuit-Breaker Control.—LEON R. LUDWIG.—Railway or polyphase power systems having a multiplicity of parallel lines are, according to the author, unique in offering possibilities for the superimposing on the lines of a frequency of the magnitude of 500 cycles to gain selective protection under all fault conditions. The principle suggested is to measure the impedance of the power system with 500-cycle current and high-frequency relays, so placed that under abnormal conditions the impedance of a faulty line as measured by the relays protecting that line only is sufficiently low to cause the circuit breaker operation. The advantages of such a protective system are recognized as: Perfect selectivity between parallel power lines; instantaneous operation, simultaneous operation of protective breakers; protection of the line against short circuits or faults, and a measure of the continuance of a fault, permitting automatic reclosing of circuit breakers. It is stated that while this super-frequency control system brings to light a number of refreshing conceptions, and while it is not completely developed at this time, sufficient experimental work has been done to warrant presenting the results as a matter of technical interest.—*Journal of the American Institute of Electrical Engineers,* June, 1928.

Rates of Voltage Building-Up Obtainable with Standard Exciters.—H. W. WASHBURN.—The problems involved in rapid excitation are of increasing interest because of the relationship to electric power transmission. The author has analyzed the several difficulties by means of calculation, using 27 standard exciters as a basis. Tabulations and curves have been prepared illustrative of the findings for the several items of equipment. Among the conclusions involved are: For standard exciters with normal self-excitation the maximum rate of voltage build-up occurs at about rated voltage; for standard machines with self-excitation, but with the field coils connected in two parallel circuits, the rate of voltage build-up is roughly four times that obtained with normal self-excitation; for standard exciters with field coils in two parallel circuits and separately excited the maximum rate of voltage build-up occurs at zero exciter voltage, and the ceiling voltage on standard machines of parallel field or with separate excitation is about 15 per cent of rated voltage higher than with self-excitation.—*General Electric Review,* July, 1928.



Rates of voltage build-up on standard exciters

Transmission, Substations and Distribution

Some Electrophysical Conditions Determining Lightning Surges.—HARALD NORINDER.—The nature of lightning surges in transmission systems is influenced by given electrostatic and electrodynamic conditions in the thunderstorm cloud. The intensity of the field, the distributions of the volume charge and the discharging character of the lightning are important in this respect. A theoretical analysis of these different factors in agreement with the real conditions in the thunderstorm atmosphere is said to be practically impossible. Theoretical speculation involving distribution of charge and calculation of the field force, the dimensions of the field regions, the regions discharged by lightning, a research of the discharging rate of lightning and similar considerations have been offered. The investigations undertaken were conducted by means of the cathode-ray oscillograph modified to meet the special conditions involved in this research and in accordance with the plans of the author.—*Journal of the Franklin Institute,* June, 1928.

The Design of Steel Transmission Towers.—WILLIAM T. TAYLOR.—The practical considerations involved in the erection of steel transmission towers and the installation of foundation structures have been considered by the author. Empirical formulas designed to express the relationship between quantities of materials and placement of essential parts are offered, as is a chart involving anchorage factors based upon the assumption that the earth above the base will carry the frustrum of an inverted pyramid of earth resting upon it whose sides make an angle of 30 deg. with the vertical. The question of economic expenditures in connection with possible distortion, decrease in strength and similar items resulting from earth foundations as compared with increased cost of concrete footing are evaluated. — *Electricity (England),* May 31, 1928.

Pressure Regulation in Mercury-Arc Rectifier Plants. — J. BLANDIN. — An analysis of the several methods of securing voltage regulations in mercury-arc rectifier plants has been offered by the author and classified according to devices which operate on the direct-

current side of rectifier sets and those which operate on the alternating-current side. The characteristics of the several devices used to accomplish this purpose and the relative value of the several types of equipment with regard to economic and service factors have been covered.—*Brown Boveri Review (Switzerland)*, June, 1928.

Electrophysics, Electrochemistry and Batteries

Electric Discharges in Liquids.—HIKOICHI OBATA.—The electric discharge in liquids is regarded by the author as an exceedingly important problem both from theoretical and practical considerations. The relation of this problem to the investigations of electrochemistry and physical chemistry, with particular reference to the change of the surface of the electrode or the properties of the liquid utilized in the investigation and with the colloidal substance obtained in the electrical discharge, is developed. In these investigations the author utilized electrodes of fourteen elements and one alloy, covering any materials which might reasonably be used for this purpose. The media in which discharge took place consisted not only of liquids, such as ethylalcohol, water and sulphuric acid, but also air and metallic vapor. The light coming from the portion of the surface of the electrode immersed in the medium was examined by spectrometers. Several types of electric circuit were employed and investigations were made of the formation of strong electric fields on the electro surface, intensity distribution of line and continuous spectra, appearance of many unknown lines, and absorption of spectra due to liquid medium. It is stated in conclusion that owing to the complexity of the problem the results obtained are somewhat of a qualitative nature. A continuation of the research is planned.—*No. 204, Researches of the Electrotechnical Laboratory (Japan).*

The Effect of Silicon on Tungsten Magnet Steel.—J. SWAN.—The so-called magnetic spoiling of tungsten magnet steel has received considerable attention by several investigators. The author has endeavored to determine the factors influencing this spoiling and has determined the effect of silicon on the formation of tungsten carbide, which is supposed to be the deteriorating factor. Micro-examination of silicon steels has been made and results indicated. The author concludes that the expectancy that a relatively small amount of silicon would retard or prevent the formation of tungsten carbide, it being hoped that high percentages would possibly eliminate the spoiling effect produced by reheating the steel for rolling or forging, is contrary to the determinations and that high temperature of reheating is necessary. The results of a few tests suggest that in the silicon steels the loss due to aging is considerably less than in steels without an appreciable amount of that element. The effect of the silicon in retarding tungsten carbide segregation forms a basis for the explanation of the larger volume change in hardening tungsten die steel, which results in the progressive contraction of the bore of circular drawing dies on repeated quenching, a property so much desired by users.—*Engineering (England)*, May 4, 1928.

Graphitic Oxide as a Depolarizer in the Leclanche Cell.—BRUCE K. BROWN.—The general subject of the use of graphitic oxide as a depolarizer to supplant or supplement the manganese dioxide now used in dry cells has been considered by the author. Cells made with graphitic oxide depolarizer are said to be similar to manganese dioxide cells, but to have a lower initial open-circuit voltage. Graphitic oxide made electrochemically is especially suitable for depolarizing purposes, according to the author, and formulas and methods for preparing depolarizing mixes have been detailed.—*Report American Electrochemical Society*, April, 1928.

Illumination

Hot-Cathode Neon Arcs.—CLIFTON G. FOUND and J. D. FORNEY.—A statement of the theoretical considerations involved in the production of light in a gas precedes a discussion of commercial devices for applying hot-cathode neon arcs and of laboratory determinations made in the investigation of such equipment. The characteristics of a Geissler discharge, the theory of the cathode drop, the effect of using a hot cathode, the construction of a hot-cathode arc, electrical characteristics of discharge, potential gradient as a function of pressure, current and tube diameter, operating characteristics, types of tubes and similar matters are considered. The results of spectro-photometric tests have been included.—*Report American Institute of Electrical Engineers*, May, 1928.

Units, Measurements and Instruments

Precision Determination of Frequency.—J. W. HORTON and W. A. MARRISON.—The relations between frequency and time are such that it is desirable to refer them to a common standard. Reference standards, both of time and of frequency, are characterized by the requirement that their rates shall be so constant that the total number of variations executed in a time of known duration may be taken as a measure of the rate over shorter periods of time. Frequency standards have the further requirement that the form of their variations and the order of magnitude of their rates shall be suitable for comparison with the waves used in electrical communication. Two different types of standard which meet these requirements are described. One consists of a regenerative vacuum-tube circuit, the frequency of which is determined by the mechanical properties of a tuning fork. The other is a regenerative circuit controlled by a piezo-active crystal. Means are provided in the case of each standard whereby the recurrent cycles may be counted by a mechanism having the form of a clock, the rate of which is a measure of the frequency of the reference standard. Data taken over a period of several years with a fork-controlled circuit show that under normal conditions its rate may be relied upon to within two parts in one million. Data taken over a much shorter time with crystal-controlled oscillators indicate that they are about ten times as stable.—*Reprint B-296 Bell Telephone Laboratories, Inc.*

Telegraphy, Telephony, Radio and Signals

Sensitivity Characteristics of a Low-Frequency Bridge Network for Locating Opens in Telephone Circuits.—P. G. EDWARDS and H. W. HERRINGTON.—The problem of locating open circuits in telephone cable conductors involves the determination of impedances. A study has been made of the degree of accuracy and sensitivity obtainable in impedance measurements with different frequencies of supply voltage. For long cables the input impedance is a hyperbolic rather than a linear function of the characteristic impedance. The error in impedance measurement arising from this functional departure proves to be least for the lower frequencies. On the other hand, the bridge sensitivity is improved by somewhat higher frequencies. A mathematical and experimental analysis of the sensitivity of impedance measurements in cable fault location by means of a De Sauty bridge indicates the desirability of using frequencies of the order of four cycles. The sensitivity is further increased by controlling the phase of the field excitation of the bridge galvanometer. This improved open location method and equipment are sufficiently accurate so that in practically all cases a fault in a 60-mile length of cable may be located within a maximum variation of plus or minus one-half the length of a cable section and therefore enables one to select, prior to the opening of the cable, one or the other of the two splices between the faults. *Reprint B-321 Bell Telephone Laboratories Inc.*

Miscellaneous

A Consideration of Tungsten-Filament Lamps in Radiation Therapy.—M. LUCKIESH.—In this discussion of the value and application of tungsten-filament lamps in radiation therapy the author has pointed out the significance of several basic factors, including the uncounted photochemical reactions, the ultra-violet suppressive characteristics of ordinary glass, the value of ultra-violet energy, the physiological effects as related to time of exposure and quantity of energy released and the penetrative power of such light.—*Journal of the Franklin Institute*, July, 1928.

News of the Industry

New York Merger Is Not Yet Authorized

Governor Smith Intervenes to Obtain Full Hearing Before Commission for Opponents of Consolidated Gas-Brooklyn Edison Amalgamation

"I REQUEST that individuals or organizations be given an opportunity to be heard for or against the question of merging electric light and gas companies now pending before your commission."

This telegram sent on Tuesday of this week by Governor Smith of New York to the New York Public Service Commission of that state lent a complexion of special interest to the hearings just held by the regulating body upon the proposed merger of the Consolidated Gas Company and the Brooklyn Edison Company, which awaits only the authorization of the commission to become a fact and which would bring about consolidation of nearly all the light and power companies in the Greater New York district under Consolidated Gas ownership.

Governor Smith's telegram was sent after he had received a wired protest from Morris L. Ernst, attorney for the Public Committee on Power in New York State, against the commission's refusal to hear representatives of that committee in opposition to the merger. The commission had held that the committee was not a party in interest, but it had granted Mr. Ernst fifteen minutes in which to attempt to establish the contrary and had permitted him to file a brief.

The Committee on Power in New York State contains some well-known New Yorkers of radical political views such as Oswald Garrison Villard and Arthur Garfield Hayes. Its members lean toward public ownership of utilities, and one of Mr. Ernst's contentions is that ratification of the merger would militate against Governor Smith's plan for state development of power on the St. Lawrence River and other unappropriated sites with hydro-electric potentialities. In his telegram to the Governor Mr. Ernst declared that the merger was being "rushed through" and that the commission should be acting as "more than a perfunctory, technical, supervisory institution" in the development of essential facts.

The Governor's request came before the commission on Wednesday, when, after a heated argument lasting three hours, it was resolved not to reopen the hearings. Chairman Prendergast and Commissioner Pooley (Republicans) voted against the motion of Commissioner Lunn and Commissioner Van Namee (Democrats) to comply with the Governor's request. Commissioner Brewster, a Democrat, was absent on account of eye trouble. It is thought possible that the hearings may yet be reopened when Mr. Brewster is able to attend.

A memorandum from the city of New York was filed with the commission on Wednesday as part of the record of the hearings. In it Dr. John Bauer, the city's expert, questions the fairness of the basis of exchange of securities. It is alleged that the purchase price for the Brooklyn Edison, based on recent quotations, is far too high and that because of this rates to consumers may be maintained at an unfair level.

A 35,000-Kw. Unit Follows a 30,000-Kw. at Zilwaukee

Increase in the demand for power in Saginaw and Bay City, due primarily to a program of expansion by the General Motors Corporation, has compelled the Consumers Power Company to proceed at once with the installation of additional generating capacity at its Saginaw River steam plant at Zilwaukee, approximately midway between Saginaw and Bay City.

Decision to install a new 35,000-kw. turbo-generator comes right on the heels of the completion at this station of a 30,000-kw. machine which has been in service but a few weeks. The new unit will increase the station capacity to 105,000 kw. for system use, with an additional 3,500 kw. for power-house requirements. The new machine will be operated on a pressure of 350 lb. to the square inch, and three new boilers will be required, making a total of twelve for this plant. The new unit will require an extension to the turbine and boiler-house structure and to the substation steel structure.

Plans call for the completion of this machine on July 1, 1929. It will generate at a voltage of 12,000, and the output will be stepped up through autotransformers to the local distribution pressure of 24,000 volts. The generator switch will be on the high side of the transformer bank. The capacity of this unit will be available for the requirements of the industrial loads in Bay City or Saginaw direct or may be stepped up to 140,000 volts for system distribution.

Banker and Educator Defend Utilities

Federal Trade Commission's Investigating Methods Criticised and Right to Examine Textbooks Upheld Before Meeting of Wisconsin Electrical Men

TWO stirring addresses by prominent public men outside the industry, criticising the method of the federal investigation and maintaining the right of any industry to object to statements in school textbooks that do not convey the truth, added national interest to the annual convention of the Electric Section of the Wisconsin Utilities Association in Appleton, July 26-27. It attracted approximately 160 representatives of central-station and supply houses. A. R. Frahm of the Northern States Power Company, Eau Claire, was elected chairman of the section, succeeding Grant Ford, Wausau. D. G. Evans of the Wisconsin Gas & Electric Company, Racine, was elected vice-chairman.

M. D. Smiley, vice-president of the First National Bank, Appleton, speaking on the topic "Injuring Business by Investigations," asserted that every business which enjoys the good will of the public shrould be protected against newspaper misrepresentation until it has been proved that it has been guilty of willfully practicing unfair business methods. "The hearings conducted by the Federal Trade Commission are, above everything else, *ex parte*," said Mr. Smiley, "and under the Senate resolution were never intended to be anything else. The commission, which had been under attack previously, is now defending its very life, but that is no reason why it should make the utility industry suffer."

M. C. Potter, superintendent of public schools in Milwaukee, defended his participation in the work of the association's committee on co-operation with educational institutions, which made a survey of textbooks in use in Wisconsin schools, and vigorously asserted that the utilities had a perfect right to present their point of view to authors of textbooks. He declared that modern instructional methods invited information on practical life and that unless educators continued to seek this vitalizing contact with everyday affairs, the entire "project" method of education would wither and die. Mr. Potter declared that he was as willing to meet with utility men or read their communications as heretofore.

The association appointed a committee to investigate the feasibility of reconstructing the first hydro-electric plant in the world on the site in Appleton where it was built in 1882.

G. C. Neff, vice-president of the Wisconsin Power & Light Company, spoke on the unfair comparisons to which electric companies are being subjected by candidates in the present state political campaign. He asserted that rates in Wisconsin are based on the cost of service under Wisconsin conditions and not upon Ontario conditions.

L. J. Beckwith, Milwaukee, chairman of the radio co-ordination committee, urged electric companies to be prepared to meet the interference problems, which will be greater in the future than in the past owing to the higher sensitivity of the radio-frequency apparatus that is now being placed upon the market.

D. G. Evans, Racine, chairman of the overhead systems committee, said that more care than usual is necessary to keep down the costs of construction and maintenance methods, because utilities are in a period of high capital, material and labor costs. New methods of economy should be introduced into rural overhead lines, he said. Calling attention to the experience of a number of utilities in cutting down pole-setting costs by the use of earth-boring trucks equipped with pole derricks, he cited the experience of one company which shows a saving of $6,500 in fourteen months in setting about four thousand poles.

C. D. Brown, Milwaukee, chairman of the substation committee, asserted that there is need for the development of an induction-type circuit-opening relay, in order that the simplicity of the circuit-opening relay with its direct tripping may be combined with the ruggedness and accuracy of the induction relay for protection of unattended substations used in rural or small urban communities. The committee's recommendation that separate grounds should be provided for each class of service inspired considerable opposing opinion.

G. V. Rork, Owen, chairman of the rural electric service committee, reported that up to June 30 of this year 18,227 farms had been connected for central-station service, an increase of 41 per cent over last year. The average kilowatt-hour consumption per farm in Wisconsin is now 597. Eliminating three companies, he said the average would be 659 kw.-hr. for more than seventeen thousand farms.

R. E. Johnson, director of the electrical standards laboratory of Wisconsin University, presented tables showing tests on copper-plated ground chains for break-down voltage and resistance data and also current-carrying capacities of ground chains. In one demonstration test to the convention he put 1,500 volts across one foot of ground chain before it broke down. The tests showed that after the ground chains became worn and wet they afforded no protection to workmen.

M. H. Frank, Fond du Lac, chairman of the Public Relations Section, stated that because improved physical service at less cost is the foundation upon which improved public relations are built the service which technical men can render the industry is becoming mort important as the service requirements of customers are raised. He declared that the demand for technically trained men in the electrical industry is greater than the supply provided by universities.

Other speakers and their subjects follow: Grant Ford, Wausau, chairman's address; W. E. Schubert, Appleton, "Pulverized Fuel for a Steam Generating Station of 25,000 Kva. Capacity"; J. E. Miller, Milwaukee, "Keeping the Meter Accurate"; F. H. Farmer, Chicago, "Application of Electric Drive to the Paper Industry"; A. R. Frahm, Eau Claire, "Inductive Co-ordination Work."

N.E.M.A. Policies Men Will Meet Less Often

This Decision, with Provision for Insignia and Move to Eliminate Substandard Material, Among Actions Taken at Association Island Meeting

IMPORTANT industry policies were adopted by the Policies Division of the National Electrical Manufacturers' Association when it met at Association Island, N. Y., July 29-Aug. 1, and actions were taken on many subjects, including the elimination of substandard material, the use of N.E.M.A. insignia of quality on manufactured products, a reduction in the number of meetings and the development of proper cost accounting methods in the various sections.

In his address before the first general session Huntington B. Crouse, president of the N.E.M.A., pointed out that the organization now has the proper set-up for most effective co-operation within the sections and with the board of governors and urged the active and whole-hearted support of every member. Clarence L. Collens, vice-president in charge of the Policies Division, emphasized the value of meetings in bringing about friendship and creating a better mutual understanding of individual and collective problems.

The changes in the constitution and bylaws which were approved, subject to formal ratification by letter ballot, reduce the number of meetings by about one-half. The annual meeting will be changed from the spring to the fall, and provision was made for the election of nine members to the board of governors annually from a newly created section council, composed of section chairmen and divisional chairmen. Mr. Crouse will be executive head of the Policies Division and chairman of the section council.

At a meeting of the board of governors approval was given to the report of the insignia committee, which embodied the principle of identifying manufactured products, meeting N.E.M.A. standards and those of the American Engineering Standards Committee by means of marks or insignia developed in the various sections. Such listings are to be made with a view to public service and under a plan of proper test and inspection by an impartial testing laboratory, and they must be approved by the board.

Boulder Dam Board Has First Meeting

General Sibert Elected Chairman and Professor Berkey Secretary—Members Addressed by Work and West—To Meet in Denver This Month

ONE of the most important duties of the Boulder Dam Commission is to form a conclusion as to the extent to which earthquakes constitute a practical hazard to dams in the lower Colorado River. This opinion of W. J. Mead, professor of geology at Wisconsin State University and a member of the commission, was expressed after the initial meeting of that body in Washington on July 30.

Little was done at this meeting other than organization. A conference with Dr. Elmer Mead, chief of the Reclamation Bureau, was held. Major-General William L. Sibert, retired, was chosen by his fellow members to be chairman. Charles P. Berkey, one of the geologists on the commission, was elected secretary. Offices for the use of the commissioners were made available in the Bureau of Reclamation. It is expected that the commission will leave Washington on Aug. 15 for Denver, where a further study of existing engineering data will be made. After that the commission will visit the dam site. It is then expected that a further study will be made of records in Denver, after which the commission probably will return to Washington to write its report.

Former Secretary Work, who appointed the commission on instructions from Congress, in remarks at the organization meeting, indicated that he does not believe any further engineering study is necessary, but assured the members of the commission that officials of the department will be ready and willing to weigh any new evidence that the commission may unearth. Secretary West also spoke.

Purchases and Mergers

The American Utilities Company, a holding company managed by Gannett, Seelye & Fleming, 50 Broadway, New York, and Harrisburg, Pa., has recently purchased the electric plant of the Jellico Electric Light, Heat & Power Company at Jellico, Tenn., and the electric plant of the Safford Light & Power Company at Safford, Ariz.

Acquisition of the Montgomery Electric Light & Power Company of Canajoharie, N. Y., is sought by the New York Power & Light Corporation. No opposition to its application has been made.

Sale of the electric distribution system in Irwin, Iowa, to the Iowa Public Service Company was authorized recently at a special election, the utilities company paying $20,000 for the system.

The Mutual Light & Water Company, Brunswick, Ga., a subsidiary of the Southeastern Power & Light Company, has purchased the municipal electric distribution system in Darien, Ga., and will immediately undertake its rehabilitation. Darien was formerly supplied wholesale by the Mutual company.

Utility Wages Fight for Life in Paducah, Ky.

A four-page advertisement in the Paducah (Ky.) *News-Democrat* was one of the means used by the Kentucky Utilities Company to hold its franchises in that city against the efforts of the city authorities to bring about the sanction of a bond issue for a municipal plant. (See ELECTRICAL WORLD for June 23, page 1360.)

The advertisement in question contained a list of 4,524 electric customers of the company and the increased or decreased percentage in the amounts they paid monthly under rates which went into effect on April 1. The list showed that 4,447 customers had an average decrease of 16 per cent, or a total of $3,620, and that 77 customers had a total increase of about $69. Minimum-charge customers, numbering 2,167, were not listed. They paid $1 monthly, instead of 50 cents, as formerly, and to this increase was attributed most of the agitation, which culminated in the recent first passage by the City Commission of a bill providing for submission to the voters of a bond issue of $800,000 for a municipal plant.

Now the company has adopted a new schedule, which became effective Aug. 1, reducing the minimum charge to 50 cents again and providing a further reduction of 15 per cent from the top electric rate. Current opinion is that the citizens will be content with these substantial concessions and that the bond issue, if it shall be submitted, will be voted down by a decisive majority.

Southern California Edison's Five-Year Program

The Southern California Edison Company is planning to spend $130,000,000 in the next five years on new construction, according to an announcement just made. About $95,000,000 of this amount is expected to be expended for distribution facilities. In the last five years the company has spent $138,000,000 for its construction work, largely in adding to its production facilities.

Some time this month the company will place in operation another water-power unit in its Big Creek-San Joaquin hydro-electric system. The plant, which has been under construction for two years, will be of 107,000 hp. capacity.

Niagara Falls Not Bent on Suicide

So Finding, International Board in Interim Report Rejects Elaborate Plans to Regulate Flow While Recommending Remedial Works at Horseshoe Fall

IN AN interim report which was read before the annual convention of the American Society of Civil Engineers, held at Buffalo in the latter part of last month, the special international Niagara board appointed by the governments of Canada and the United States to determine how the scenic beauty of Niagara Falls and rapids can best be maintained and by what means and to what extent the impairment thereof by erosion or otherwise can be overcome, and, consistent with the preservation of the scenic beauty of the Falls and river, to determine what quantity of water additional to that permitted to be diverted by the boundary waters treaty of 1909-10 might be diverted, either temporarily or permanently, outlined certain initial remedial measures which might be profitably undertaken in the immediate future, such measures to constitute an integral and considerable part of the complete works which will be recommended in the board's final report.

The board's investigations demonstrate that three principal conditions have been developing which have reacted directly upon the scenic beauty of the Falls: (a) the recession upstream of the crestline, (b) the culmination of a cycle of abnormally low run-off years in the Great Lakes system, (c) the withdrawal of water for navigation, sanitary and power purposes.

On the subject of recession the board concludes as the result of an exhaustive geological study that there is no danger of the Horseshoe Fall degenerating into a cascade or destroying itself by cutting a deep "notch." On the contrary, it says that the "toe" of the Horseshoe is growing broader. The fact that during recent years a large part of the flow has been diverted for power purposes has probably decreased the rate of recession of the Horseshoe. The recession of the American Falls is negligible.

With regard to the abnormally low water conditions which culminated in February, 1926, it is the opinion of the board that there is no evidence to indicate that there has been any consistent long-period change in the average rate of either precipitation or evaporation over the Great Lakes watershed. Recurrent and dependable periods of average and high flow in the Niagara River may, therefore, be anticipated with only rare periods of abnormally low flow.

Coming to the withdrawal of water for power purposes, the board says this is subject at all times to the control of the two governments, and any increases can be conditioned upon the construction of remedial works designed to distribute the waters of the river so as to insure at all seasons unbroken crestlines on both the Canadian and American Falls and an enhancement of their present scenic beauty. The board is, therefore, of the opinion that the scenic beauty of the Falls can be preserved for the enjoyment of future generations, and that by suitable remedial works designed to distribute the water over the now bared flanks of the Canadian Fall and to insure a more dependable flow over the American Fall the tendency toward erosion in the bend of the Horseshoe can be modified and at the same time an enhancement of scenic beauty insured.

As it believes the Falls to be in no danger of "committing suicide," the board has rejected all plans involving elaborate works in the main part of the rapids as unnecessary and as destructive of some of the principal scenic effects. The type of construction considered as best suited properly to rewater the flanks of the Horseshoe is a combination of excavations and submerged weirs carried from the shores near the flanks into the adjacent main currents only far enough to accomplish the desired end.

The initial remedial works proposed consist of the removal of exposed shoals in conjunction with the construction of submerged weirs lying diagonally and irregularly across the current, with incidental and co-ordinated excavation designed to deflect water from the heavy currents to the north and south of the central shoal, to distribute the water over the floor of the shelf adjacent to both shore lines and to the crest of the Falls, and to merge into the general effect of the existing cascade. The lack of volume of the American Falls and rapids and of the flow around Three Sister Islands can be remedied by raising the level of the Grass Island Pool approximately one foot at low stages by means of an irregular submerged weir or weirs upstream from Goat Island. The board recommends therefore that the first step be the construction of the works at the Canadian and American flanks of the Horseshoe Fall and the second step the placing of the upper weir. Total cost is put at $1,750,000.

The special international board which has these Niagara investigations under way consists of two members for Canada —J. T. Johnston, director of the Dominion Water Power and Reclamation Service, and Charles Camsell, Deputy Minister of Mines, and two members for the United States—Major DeWitt C. Jones, district engineer at Buffalo, and Dr. J. Horace McFarland of Harrisburg, Pa.

Columbia System Increasing Its Generating Capacity

In order to meet expected demands for electric power for commercial purposes in 1928 the Columbia Gas & Electric system is to install additional generating facilities at its present Ohio stations, West End, Columbia and Miller's Ford, serving Cincinnati, Dayton and adjacent territory. The additions to each station will, it is thought, obviate the necessity of erecting a complete new generating station.

The four generators now at West End, rated at 31,250 kva., will be replaced by four new generators which will each have a rating of 45,000 kva. The present turbine, operating at 250 lb. gage and 600 deg. F. total temperature, will be rebuilt to have a capacity of 40,000 kw. These turbines will be able to operate at 700 deg. F. if re-

quired. The increased generating capacity will necessitate changes in the switching equipment and bus structure.

Two of the 31,250-kva. generators now operating at West End will be moved to the Columbia station, where they will be direct-connected to two new high-pressure General Electric turbines rated at 16,000 kw. and operated with steam at 600 lb. pressure and 725 deg. F. total temperature. The steam from the new high-pressure units will be exhausted at 185 lb. gage and 490 deg. F. total temperature, and after having its temperature increased in a reheat boiler to 725 deg. F., it will be used to supply the present low-pressure units, rated at 94,736 kva. The new rating of the units will be 74,000 kva. each. Provision will be made so that the low-pressure units may be operated from the high-pressure steam supply in case of a failure of the high-pressure units.

At the Miller's Ford station there are at present two 12,500-kw. units and three 20,000-kw. units. A sixth turbine of 25,000 kw. capacity is now being installed and will raise the total station capacity to 110,000 kw.

When completed, the new station capacities will be: Columbia, 148,000 kva.; West End, 180,000 kva.; Miller's Ford, 137,500 kva.—a total of 465,500 kva.

Cincinnati Company to Serve American Rolling Mills

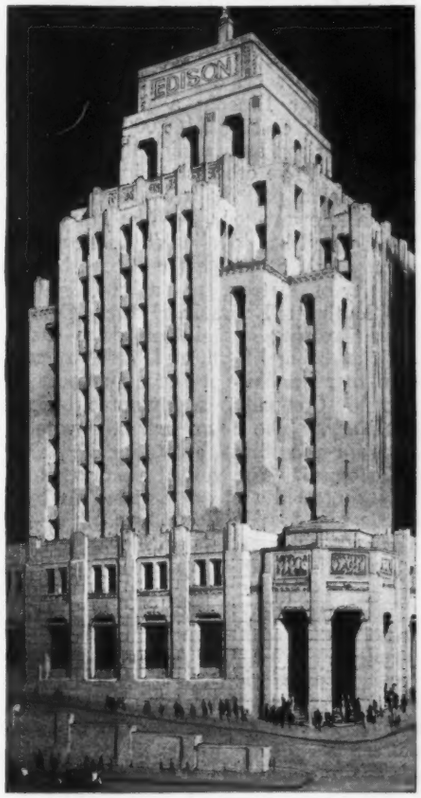
The Union Gas & Electric Company of Cincinnati has contracted with the American Rolling Mills Company to supply the latter with 10,000 kw. to 15,000 kw. for operating electrical equipment recently installed in its Middletown plant. Power is supplied over a 4-mile, 66,000-volt, double-circuit, steel-tower line supporting 397,500-circ.mil A.C.S.R. conductors and two overhead ground wires. A feature, which has already proved its value on other lines of the company, is the use of fused horns and grading rings to clear insulator flashovers.

The customer will distribute the power at 6,600 volts to various load centers from a substation built by it and containing two 12,000-kva., 66,000/6,600-volt, self-cooled transformer banks. Switching at the customer's end is on the 6,600-volt side, the transformers being considered a part of the transmission line, an arrangement which has made possible the elimination of 66,000-volt oil circuit breakers at the customer's substation.

The original part of the Middletown plant is supplied by the American Rolling Mills Company's own generating plant at 25 cycles. The new load, to be carried by the Union Gas & Electric Company, will be 60-cycle. The Trenton substation of the latter company, 3½ miles south of Middletown, is about half way between Cincinnati and Dayton, in and between which cities the power company's main territory lies. It is supplied by four 66-kv. transmission lines, two from Dayton and two from Cincinnati.

Southern California Edison's New Office Building

Plans for a new office building for the Southern California Edison Company, to be erected on the northwest corner of Fifth and Grand Streets, Los Angeles, have been made public by John B. Miller, chairman of the board. This location overlooks the Los Angeles Public Library and the Biltmore Hotel. Taking advantage of the natural elevation, the architects, Allison & Allison, have planned a height-limit building (twelve stories) of the modern setback style. The Edison Building will occupy a lot 175 ft. by 175 ft., and the combined floor area of the twelve stories will be 250,000 sq.ft., providing amply for the company's needs with a generous allowance for expansion. Basement space



Architect's drawing of façade

will be utilized for a two-story garage with room for 100 cars.

Passing through a decorative loggia entrance on the corner, the visitor will come into a corridor where sturdy columns will support a Spanish Renaissance ceiling. This corridor will open into the elevator lobby in the center of the building, while back of the corridor will be the investment department's quarters. Each floor is designed for the efficient operation of interdepartmental business, the eleventh floor being reserved for the general executive offices. The president's office and directors' room will occupy the twelfth floor, opening on two balconies which will give a magnificent view of the city.

Provision for display rooms, an auditorium, club rooms and a model kitchen is being made. Electrical equipment of the most modern type will be installed throughout the structure, and flood-lighting effects already planned are expected to be particularly effective. Excavation will start in the fall, and the building will be ready for occupancy early in 1930. The estimated cost of building and land is $2,500,000.

Power in Saskatchewan

This Western Canadian Province Has Hydro-Electric Resources Totaling 542,000 Hp. Under the Ordinary Flow of About Twelve Streams—Coal Reserves Also

WITH the rapid growth of the prairie provinces of Canada during the last few years there has come an increased demand for electrical energy, and while Manitoba and Alberta have been the most active in this respect, Saskatchewan is also rapidly forging ahead. Last year the Saskatchewan government appointed a commission to report upon the economic practicability of generating power at central fuel-power plants and at water-power sites and distributing it throughout the province. This commission, under the chairmanship of L. A. Thornton of Regina, carried on a very active program of investigation.

A recent estimate by the Water Powers Branch of the Dominion government gives the total available water-power resources of Saskatchewan as 542,000 hp. under conditions of ordinary minimum flow, or 1,082,000 hp. ordinarily available for six months of the year. The most important power possibilities are found on the Churchill, Reindeer and Saskatchewan Rivers. On the main Saskatchewan there are six sites which are estimated to aggregate from 72,000 hp. to 350,000 hp. The North Saskatchewan below Prince Albert has a power possibility at La Colle Falls, where under a head of 28 ft. the possible power is estimated to be from 3,400 hp. to 15,000 hp. The sites on both the main Saskatchewan and its North Branch, as purely water-power developments, suffer from the disability of extremely low flow in winter and excessive floods in summer, but in conjunction with fuel power stations these high spring and summer flows become valuable power assets, and the Saskatchewan River sites afford the basis of reasonably low-cost power for the central portion of the province.

The Sturgeonweir, a tributary to the lower main Saskatchewan, flows from the Laurentian territory to the north and has several sites offering possibilities which aggregate from 2,600 hp. to 4,200 hp. On the Churchill there are eight sites whose possibilities total from 298,000 hp. to 366,000 hp. These furnish the most important possibilities in the province. Of the tributaries of the Churchill, the Reindeer, backed by the large area of Reindeer Lake, has powers aggregating from 82,000 hp. to 106,000 hp., the Foster from 900 hp. to 2,700 hp., the Rapid from 4,600 hp. to 5,700 hp.,

the Mudjatik from 600 hp. to 1,700 hp., and the Beaver from 800 hp. to 2,300 hp. Of the rivers flowing toward Lake Athabasca, the Geikie has possibilities of from 2,400 hp. to 7,400 hp. and the Black of from 73,000 hp. to 218,000 hp.

No commercial development of water power has so far taken place in the province. There are, however, indications that the mining area of the northeastern part of the province and the adjacent part of Manitoba will soon require large quantities of hydro-electric energy. The powers on the Churchill and adjacent rivers are well situated to furnish this prospective market with an ample supply of low-cost power.

A survey of southern Saskatchewan, in the vicinity of the coal fields, shows heavy alkali ground waters in the western portion of the field, with the Souris River as the only logical body of water draining an area where the alkali deposits are not so prominent as in the western section, and with its course so situated as to render the creation of a very large reservoir of water economically feasible without serious damage to arable land in the vicinity, storing sufficient water both for a very large electric generating station and for all industrial undertakings which might be established in the vicinity.

While water-power development on an extensive scale appears to be the goal aimed at, steam generation is destined to play an important part in the economic development of the province for some time to come. The Mid-West Utilities Company, which is controlled by the International Utilities Corporation, is operating plants in various parts of the province, principally at Watrous, Rosetown, Kindersley and Lloydminster, and has plans in view for the extension of transmission lines from central distributing plants. It is considered that this system of central distribution, having regard to the scattered development and wide areas at present thinly populated, is much more economical and sounder than long transmission lines.

In a report just issued the Saskatchewan Power Commission recommends the immediate purchase of the municipal plants at Regina, Moose Jaw and Saskatoon as the initial step in the development of a provincial power scheme. The commission proposes that Regina and Moose Jaw should be connected by a transmission line to form a southern system and that a northern system should be formed by linking Saskatoon and Prince Albert and the Battlefords. Immediate reconstruction of the Saskatoon plant, at a cost of $1,500,000, is recommended, together with the purchase of the Prince Albert and North Battleford plants.

The commission's plan envisages a capital investment of $6,700,000, of which $5,500,000 would be needed immediately and the balance of $1,200,000 in 1934 to meet a predicted consumption of 150,000,000 kw.-hr. It is suggested that power would be sold in bulk to the municipalities from the central plants at cost, plus a small margin for contingencies.

Briefer News

REPRESENTATIVE SWING PREDICTS PASSAGE OF BOULDER DAM BILL IN DECEMBER.—With nearly a hundred members, gathered from Los Angeles, San Diego, Riverside, Orange, San Bernardino and Imperial Counties, as well as from Nevada and Arizona, the Boulder Dam Association held its annual meeting at Long Beach, Calif., on July 21. Representative Swing, co-author of the Swing-Johnson Boulder Dam bill, predicted the passage of that measure in December, asserting that only overconfidence on the part of its proponents could bring about defeat. John L. Bacon of San Diego was re-elected president.

PUBLIC AND PRIVATE PLANTS IN NEBRASKA.—The State of Nebraska has just put into service at the state penitentiary near Lincoln a new electric power plant costing $160,000. It will heat the prison and furnish light to the Capitol and five other state institutions. Thirty farm patrons are served at 7 cents a kilowatt-hour.——The Harvard City Council has invalidated an election recently held at which the voters, by a majority of thirteen, gave a franchise to the Southern Nebraska Power Company, throwing out sixteen votes cast for it as being illegal, and has granted a ten-year franchise to the Clay County Electric Company, a manufacturers' subsidiary. The town recently voted bonds for a municipal plant, but the plan was dropped. The voided election was hotly contested and participated in by the League for Public Ownership.—— Wayne is to house its municipal plant in a new building.

ALABAMA POWER COMPANY ASKS LEAVE TO IMPOSE SERVICE CHARGE.— Permission from the Alabama Public Service Commission has been asked by the Alabama Power Company to impose a service charge in Rogersville and six other small communities of not less than $1.30 for a home of five rooms or less and 20 cents for each additional room up to ten. If consent is obtained, this would probably be the precursor of a similar charge in all cities served by the company, with an adjustment of rates for energy consumed. The commission recently abolished a service charge for gas in Montgomery, and state-wide interest is being manifested in the action it will take on the present application.

MINNESOTA BOUNDARY WATERS TO BE STUDIED.—Two congressional committees will spend eight days on the international boundary waters of Minnesota and Ontario in August to study the effect of the Shipstead-Newton bill, which purposes to set aside the lakeland region for recreational purposes and reforestation and to maintain natural water levels. According to reports this bill, which prohibits increased water levels except by act of Congress, would prevent construction of the series of reservoir dams along the boundary waters proposed by E. W. Backus for power development. The measure will be before Congress for consideration at the next session.

PROGRESS ON SAN DIEGO PLANT EXTENSION.— The 28,000-kw. generating unit being installed as an extension to Station B of the San Diego (Calif.) Consolidated Gas & Electric Company will from present indications be completed on the scheduled date, Oct. 1, according to Vice-President H. W. Fuller of the Byllesby Engineering & Management Corporation. Work was started in January of this year. The new building, at Kettner Boulevard and Broadway, will be of steel and concrete and built in the Spanish type of architecture, and it will be large enough to permit the installation of a second unit. Installation of the new generator will increase the capacity of Station B to 64,000 kw. A large cooling-water tunnel is being constructed from the ocean to the plant which involves unusual construction difficulties as it is an underwater job. The new building will rest on concrete piling throughout.

HITCH IN THE PLANS OF SPRINGFIELD (MASS.) COMPANY.—Plans already reported of the United Electric Light Company of Springfield, Mass., to enlarge its plant on the Connecticut River bank by means of additional land acquired through a general exchange of holdings by the city, the New York, New Haven & Hartford Railroad, the Springfield Gas Light Company and the United Electric have apparently met with an obstacle in a communication from the United States Department of War to the Mayor of Springfield stating that the department is obliged to deny the application for a permit to make filled land along the river bank on the ground that the work contemplated would be an undue encroachment on the channel of the river and would cause a flood menace. As the only means of obtaining the additional land sought lay in the plan of providing filled land, progress in this regard is at a standstill, and a revival of the United Electric Light Company's proposal to move its plant across the Connecticut River to West Springfield may result. President Walter L. Mulligan of the United Electric is hopeful that some way to obviate this will be found.

EXTENDING SERVICE IN NEW HAMPSHIRE.—The Public Service Commission of New Hampshire has received petitions from the Public Service Company of New Hampshire asking permission to sell electrical energy to the Parker-Young Company of Littleton and, furthermore, to construct and maintain transmission lines and to sell energy in the towns of Bristol, Lincoln, Ashland, Bridgewater, New Hampton, Holderness, Campton, Thornton, Plymouth and Woodstock. At the same time the Utilities Power Company of Meredith, N. H., operated by the Pub-

lic Service Company of New Hampshire, petitioned for permission to maintain transmission lines and sell electrical energy to the city of Laconia and in the towns of Ashland, Thornton, New Hampton, Moultonboro, Rumney, Campton, Hill, Meredith, Tuftonboro, Center Harbor, Bristol, Plymouth, Holderness and Bridgewater. These petitions represent a part of a general plan for the extension of electrical service throughout New Hampshire settlements.

I. T. & T. Preparing to Extend Radio Operations.—Two new subsidiary companies—the International Cables Corporation and the International Communications Corporation—have been incorporated at Albany, N. Y., by the International Telephone & Telegraph Corporation. While no statement has yet been given out by the last-named company concerning its plans, it is understood that there is no intention of escaping the restrictions of the White act, which prohibits the merger of competing cable and radio companies. Both of the companies just incorporated have for their object the construction, operation and maintenance of telephone, telegraph and cable lines and wireless systems here and abroad, as well as television and telephoto transmission, and undoubtedly they will play a part in the international competition now looming in this field.

Seven Sisters Falls Site Will Probably Be Leased to Winnipeg Company.—Control and administration by the government of Manitoba of the famous Seven Sisters Falls on the Winnipeg River being now regarded as a certain result of a proposed agreement between that government and the federal authorities, there is every likelihood that this valuable power site will be leased to the Winnipeg Electric Company. The action is not anticipated, however, before the fall, as it will be several weeks before the negotiations between the provincial and federal authorities are concluded. During the last session of the Dominion Parliament there was a lively controversy as to power development at Seven Sisters Falls, both the Winnipeg Electric Company and the provincial government seeking the right to develop the site. Later, however, Premier Bracken withdrew the provincial application, leaving the field to the private interests.

Washington's Home Electrified.—Electric lights have replaced candles at Mount Vernon, Va., home of George Washington and the outstanding shrine of the nation. Present-day facilities have been installed without marring the ancient beauty of the historic estate. The Mount Vernon Ladies' Association has entered into a contract with the Virginia Public Service Company to supply electrical energy to operate a generator already installed. All buildings on the place except the mansion are supplied with electricity through underground conduits. No modern equipment is permitted within the home itself. The old kitchen is equipped with an electric range and a refrigerating plant. Woodlawn, adjoining Mount Vernon, home of Nellie Custis Lewis, and now occupied by former United States Senator Oscar W. Underwood of Alabama, is also equipped with electricity, as are old Christ Church in Alexandria, where Washington was a vestryman, and the Fairfax mansion, Mount Eagle, near Alexandria.

Portland (Ore.) Citizens Fail to Respond to Commission's Suggestion.—The public hearing held by the Oregon Public Service Commission for the purpose of affording light and power customers the privilege of naming the method by which a new valuation of properties owned by the Portland Electric Power Company should be determined proved a failure in so far as any practical assistance from the citizens was concerned. In advertising the hearing and thus departing from the usual rules of regulatory procedure, the commission hoped to ascertain the will of the people before undertaking the expenditure of possibly a half million dollars for the valuation of this major utility, but the citizens declined even to appear, much less offer any helpful suggestions or recommendations. Left to proceed with the matter on its own initiative, the commission entered an order that the valuation of the Portland utility be brought up to date and that the last valuation of the properties' made in 1916, be used as a basis for the present proposed appraisal.

Coming Meetings

[A complete directory of electrical associations, with their secretaries, is published in the first issue of every volume. For latest list see issue for July 7, page 48.]

Camp Co-operation VIII—Association Island, Henderson Harbor, N. Y., Aug. 2-7. Society for Electrical Development, 420 Lexington Avenue, New York.

Association of Electragists International—Hotel Stevens, Chicago, Aug. 6-11. L. W. Davis, 15 West 37th St., New York.

American Institute of Electrical Engineers—Pacific Coast convention, Spokane, Wash., Aug. 28-31. F. L. Hutchinson, 33 West 39th St., New York.

Pennsylvania Electric Association—Bedford Springs, Pa., Sept. 5-7. H. A. Buch, Telegraph Bldg., Harrisburg, Pa.

Maryland Utilities Association—Braddock Hotel, Braddock Heights, Md., Sept. 7. D. E. Kinnear, 1005 Continental Bldg., Baltimore.

Western Section, International Association of Electrical Inspectors—Cosmopolitan Hotel, Denver, Sept. 10-12. W. S. Boyd, 175 West Jackson Blvd., Chicago.

Illuminating Engineering Society—Toronto, Can., Sept. 17-20. L. H. Graves, 29 West 39th St., New York.

Rocky Mountain District, N.E.L.A.—Hotel Colorado, Glenwood Springs, Sept. 17-20. (With Colorado Utilities Association.) O. A. Weller, Public Service Co. of Colorado, Denver.

Empire State Gas and Electric Association—Saranac Inn, Upper Saranac, N. Y., Sept. 20-21. C. H. B. Chapin, Grand Central Terminal, New York.

American Electric Railway Association—Cleveland, Sept. 22-28. J. W. Welsh, 292 Madison Avenue, New York.

International Committee on Illumination, Saranac Inn, Lake Saranac, N. Y. Sept. 22-28. (See Illuminating Engineering Society.)

New England Section, N.E.L.A.—Poland Springs House, South Poland Springs, Me., Sept. 24-27. Miss O. A. Bursiel, Statler Bldg., Boston.

Great Lakes Section, N.E.L.A.—French Lick Springs, Ind., Sept. 27-29. R. V. Prather, 205 Illinois Mine Workers' Bldg., Springfield, Ill.

Association of Edison Illuminating Companies—Chamberlin-Vanderbilt Hotel, Old Point Comfort, Va., Oct. 1 to 5. P. S. Millar, East End Ave. and 80th St., New York.

Speedy Beginning of Work on Big New Tennessee River Plant Promised.—Announcement that the Mississippi Power Company, subsidiary of the Southeastern Power & Light Company, has been authorized by the Federal Power Commission to proceed with a hydro-electric development at Riverton, 36 miles down the Tennessee River from Wilson Dam, is followed by a statement that work on this new development will be begun in the near future. Construction cost is estimated at $25,000,000, and, as stated last week, an initial installation of 100,000 hp. is proposed, with provision for an ultimate installation of 260,000 hp. The original hearing on the application of the power company was held in the summer of 1927, at which time representatives of various towns in Mississippi and Alabama were present, some to voice approval and others disapproval of the step. Some stressed the fact that the power was needed for development in Mississippi, while others contended that the Riverton site might later be needed as an adjunct to the Muscle Shoals development. Others also contended that sites on the Tennessee River should not be disposed of until after the Muscle Shoals problem is settled. Following the hearing last year, action on the permit was delayed by the Federal Power Commission.

High-Tension 96-Mile Line to Connect Oneida and Binghamton, N. Y.—The electric power supply available to Cortland, N. Y., and the rest of the territory served by the Cortland County Traction Company will be greatly increased by the construction of a 110-kv. transmission line from Oneida to Binghamton, plans for which are rapidly being completed. The new line, which was projected following acquisition of the Cortland company by the Mohawk-Hudson Power Corporation, will definitely tie Cortland into the extensive interconnected transmission system operated by the companies in the Mohawk-Hudson group, where there is a total generating capacity of well over 300,000 kw., the other major utility systems with which the Mohawk-Hudson system is connected having an additional aggregate capacity of 1,125,000 kw. The new line will be of single-circuit, twin-pole construction, and it is expected that the power line and the necessary substation will be completed this year. The portion of the line from Oneida to a point about 7 miles below Cortland, or approximately 54 miles, will be built

by the New York Power & Light Corporation. Here it will meet a new 42-mile line being built by the Binghamton Light, Heat & Power Company and will complete a high-capacity circuit for the interchange of power between the two companies. The New York Power & Light substation at Oneida receives its power supply from the Mohawk-Hudson transmission system to the east and is also tied in with the Niagara, Lockport & Ontario Power system to the west.

OREGON SPORTSMEN STILL OPPOSE RIVER DEVELOPMENT.—Four initiative measures, all similar in intent and purpose, have been officially accepted for filing by the Oregon Secretary of State and will be submitted to the vote of the people at the general election in November. These bills prohibit future appropriations of water for power or reclamation purposes from the McKenzie, North Umpqua, Rogue and Deschutes Rivers, the state's greatest water-power resources. Despite assurances formally offered by the State Fish Commission regarding the absolute safety to game and commercial fish brought about by the installation of electric screens by the hydro-electric companies in southern and central Oregon, various sportmen's associations are actively engaged in creating interest in the four measures throughout the state and are manifesting a determination to close the rivers named to any further development of power or irrigation projects.

NEW YORK & QUEENS COMPANY AGAINST MASTER METERS IN APARTMENT HOUSES.—In accordance with the policy approved by the Public Service Commission of New York, the New York & Queens Electric Light & Power Company, serving the Borough of Queens, New York City, has of its own accord added a paragraph to its conditions of service which does away with master meters in apartment houses. The added clause reads: "The company's service and supply of electrical energy for the use of owners, tenants or occupants of apartment buildings, tenements or other dwellings will not be furnished otherwise than directly to them as customers of the company, through the company's individual meters, and electrical energy will not be supplied through a master meter, under this agreement, for submetering and/or resale by or to any owner, tenant or occupant of any part of any such residential premises. The company may require any applicant or customer to furnish to the company satisfactory proof that all the electrical energy supplied to him will be or is being used by him according to these conditions. Upon any change in such use contrary to these conditions, the applicant agrees that he will forthwith notify the company thereof in writing, and that this agreement shall become null and void." The New York commission has long unsuccessfully sought legislation making such master meters illegal. Already a temporary injunction has been granted to one Queens landlord forbidding discontinuance of service to his wholesale meter.

Recent Court Decisions

FRANCHISE GRANTED ELECTRIC COMPANY EXERCISED BY DISTRIBUTION OVER ANOTHER CORPORATION'S LINES.—Under a franchise granted an electric company by a town and conditioned on the erection of specified distribution lines within a certain period there was no abandonment of franchise by nonuser, the New York Supreme Court, Appellate Division, held, in Young vs. Seneca Transmission Company, where distribution was carried on over lines erected and owned by another corporation and used by the franchise holder under a contract arrangement. Such a contract was analogous to a lease and was a satisfactory fulfillment of franchise terms. (229 N.Y.S. 138.)*

CONTESTED INSTRUCTIONS BEARING ON NEGLIGENCE ARE UPHELD.—Sustaining (in Culbreath vs. Arkansas General Utilities Company) a verdict of $10,000 damages for injuries to a man who fell into a post hole dug by the company in a path along which he had started to walk, the Supreme Court of Arkansas overruled a number of objections to the trial judge's charge. It was not error, the Supreme Court said, for the judge not to stress the phrase "contributory negligence" since he told the jury that they must find that plaintiff was "exercising ordinary care," this having the same force; the law does not require that a defendant's negligence shall be the "sole" cause of injury and that word was not struck wrongly from a requested instruction; refusal to charge that the company was obliged to exercise only "ordinary" care to keep the hole covered was justified, because of the negligence imputed in digging the hole where it was, and the words "or otherwise properly safeguarded" were not prejudicial or susceptible to the construction that the company was bound to make the place safe. (6 S.W. [2d] 296.)

PUBLIC USE AND EMINENT DOMAIN.—In sustaining the validity of the New York water-power law (ELECTRICAL WORLD, June 2, page 1159) the New York Supreme Court, Appellate Division, in State of New York vs. Public Service Commission and Niagara, Lockport & Ontario Power Company, upheld that company's right to institute eminent domain proceedings as regards certain sites on the Salmon River in these words: "We hold that the use of the additional light, heat or power to be produced by respondent at its new power site cannot be refused when demanded by the public. The only theory upon which the Legislature can delegate to respondent the right to take private property is founded upon the right of the general public to use the heat, light or power generated by respondent. This power company cannot and will not be allowed to avail itself of a right resting upon only one principle and later be permitted to repudiate that principle. It makes no attempt to repudiate. It professes and undertakes to serve the public and will be held to such profession and undertaking. . . . The commission may fix just and reasonable rates and charges for electricity manufactured, sold or supplied for heat, light or power, and may order improvement in the manufacture, transmission or supply of electricity. This respondent has in fact ranged itself within the jurisdiction of the Public Service Commission. There can be no doubt that the power to be generated at its new site is for a public use and must be supplied to the public on reasonable demand."

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

WISCONSIN COMMISSION'S POWER OVER DAMS.—The Wisconsin Supreme Court has sustained the action of the Wisconsin Railroad Commission in ordering the city of Baraboo to lower a dam on the Baraboo River two inches, this being the amount by which it had raised the dam without obtaining the commission's consent. The court said: "The commission—not the courts—possesses the administrative power to make orders which permit the raising or enlarging of existing dams. The court is confined to the exercise of the judicial power of determining whether the findings of the commission are supported by proof and whether its orders are reasonable and lawful. In view of the legislative intent disclosed by the act and in the absence of an express prohibition, it is held that the commission has, at all stages of proceedings before it, the power to take such proof as will enable it fairly and justly to determine the rights of all parties who come before it."

Commission Rulings

COMPANY NOT FORCED TO FILE INVENTORY OF ORIGINAL PROPERTY COSTS.—The New York Public Service Commission has ruled that the New York Edison Company need not file an inventory of property still in use and its cost at the time the company was organized in 1901. The motion for this information was made by the city in a five-year-old complaint against the company's rates filed by a previous mayor. The commission held that information concerning original costs would serve no useful purpose in view of the decision of the United States Supreme Court in the Indianapolis Water Company case, which was to the effect that rates should be based upon the present value of the useful property rather than upon costs "prior to the great rise in prices due to the war."

FACTORS IN APPROVING SALE OF UTILITY DO NOT INCLUDE CONSIDERATION OF FUTURE RATE BASE.—In approving an application from the Buckfield Water, Power & Electric Light Company for permission to sell its property to the Turner Light & Power Company, the Maine Public Utilities Commission pointed out that there was no present necessity to determine what portion of the property, if any, might be capitalized or would be recognized as a basis for rate-making purposes since the petitioner had presented neither the issue of securities nor the fixing of rates. The only considerations for its guidance, the commission said, were the legal right of the purchaser to acquire the property and the effect of the consolidation or sale upon public interest with respect to rates or service, including the petitioner's capacity to serve its present territory, meet its obligations and arrange for efficient management.

News About Men of the Industry

W. J. Hagenah Joins Byllesby Organization

William J. Hagenah will join the Byllesby Engineering & Management Corporation as vice-president and special counsel on or before Sept. 1. Mr. Hagenah is one of the best known authorities on public utility valuations and rates in the United States. Representing either state commissions, municipalities or utility companies, he has been associated professionally with many of the most important utility rate cases of the past eighteen years. Since 1911 he has been engaged in business independently as consulting engineer and rate expert with headquarters in Chicago.

A graduate of the University of Wisconsin, Mr. Hagenah became statistician of the Wisconsin Bureau of Labor in 1905 and was Deputy Commissioner of Labor in 1906. When the Wisconsin Railroad Commission was established with broader powers in 1907 he was appointed chief statistician of that body and in this connection had a prominent part in the preparation of a widely adopted uniform classification of accounts for public utilities. In 1910 and 1911 he was consulting expert to the city of Chicago in analyzing and reporting on utility appraisals, audits and rate studies. His success in these endeavors led to the establishment of his own business, which grew rapidly and achieved an international reputation.

J. A. HALE, chief engineer of the Utah Power & Light Company, Salt Lake City, was elected president of the Utah Society of Engineers at the recent annual meeting. Mr. Hale, who has been active in the work of the organization for some time, has been identified with the Utah company since 1913.

FARLEY GANNETT, president of Gannett, Seelye & Fleming, Inc., New York and Harrisburg, Pa., sailed on the *France* Aug. 4 for Europe to look after European connections which his firm is making in the public utility field. Mr. Gannett is president of the Intercontinents Public Service Company, in which investment bankers are associated with Gannett, Seelye & Fleming in the ownership of numerous public utilities in South America.

W. E. MASON has been appointed merchandise manager of the Northern New York Utilities, Inc., Rome, N. Y., to succeed W. N. Smith, who, as announced previously in the ELECTRICAL WORLD, has assumed new duties with the Northeastern Power System. For the past year Mr. Mason had been with the Northeastern Power Corporation as assistant to Col. H. C. Wilder. In that capacity he was in charge of sales contests and similar activities, the position in reality resolving itself into one of a sales promotional nature for all the properties in the system. Mr. Mason is a graduate of the Wharton School of the University of Pennsylvania.

C. A. Heinze Assumes New Duties

Carl A. Heinze, who for 21 years has been engaged in electrical engineering work with the city of Los Angeles and who for the past twelve years has been distribution engineer for the municipal Bureau of Power and Light, has been appointed assistant chief electrical engineer and general manager of the bureau. This appointment became effective July 1 and was made by the Board of Water and Power Commissioners, on the recommendation of E. F. Scattergood, chief electrical engineer and general manager of the bureau.

C. A. Heinze

The power bureau's new assistant chief and general manager recently was elected president of the Los Angeles Electrical Club for the ensuing year. Previously he served as president of the Los Angeles Chapter, American Institute of Electrical Engineers, and of the Los Angeles section, American Association of Engineers.

He first attracted city-wide attention when, under the direction of Mr. Scattergood, he assumed the task of taking over, rebuilding and co-ordinating with the original city system the Los Angeles distributing system, purchased from the Southern California Edison Company in 1922. Mr. Heinze began his service with the Los Angeles water and power projects during the early days of the aqueduct construction work and has been actively engaged continuously since that time except for the period of the war.

ROBERT WILLEMS and MARCEL MERLIN, civil engineers connected with the Belgian Ministry of Public Works, arrived in New York July 29 on the Red Star liner *Belgenland* to spend three months in this country studying hydroelectric plants. Following their stay in New York these visitors are planning to go to Washington and thence West, leaving for home some time in November.

LEE SKIPWITH of Lee Skipwith & Company, Inc., New York City, returned on the *Aquitania* on July 27 from a month's tour in Europe.

JOHN W. LIEB, vice-president of the New York Edison Company, returned from Europe July 27 aboard the Lloyd Sabaudo liner *Conte Grande* after spending two months abroad. While on the Continent Mr. Lieb attended the inauguration of the library at the University of Louvain and also the meeting of the International Union of Producers and Distributors of Electrical Energy, held in Paris. In London he attended the centenary of the Institution of Civil Engineers (British) as an official delegate of the American Institute of Electrical Engineers.

WILLIAM M. MARTIN has been appointed assistant superintendent power supply operation of the New York Power & Light Corporation, with offices at Albany. Before joining the New York Power & Light Corporation Mr. Martin was connected, for about four years, with the Monongahela West Penn Public Service Company in West Virginia, first as general district superintendent of the company's properties in West Virginia and Maryland and later as division manager of the Parkersburg-Marietta division, with headquarters at Parkersburg, W. Va. He was formerly with the West Penn Power Company for three years as division manager of the West Virginia and Maryland properties of the West Penn company and early in his career he was employed for five years by the West Virginia Utilities Company as general superintendent.

THOMAS P. MCCREA, secretary and a director of the Los Angeles Gas & Electric Corporation, has resigned, effective Aug. 1. E. E. SEAVER, formerly assistant secretary, has been named secretary to succeed Mr. McCrea and FRANK WEISS succeeds Mr. McCrea as director. Mr. McCrea entered the company's employ in 1893 in the auditing department and continued in that branch of work until 1916, when he became secretary of the company. He was elected director in 1920. E. N. Simmons, auditor, was given the additional duties and title of assistant secretary. Mr. Seaver, who succeeds Mr. McCrea as secretary, has been with the company since May, 1907, and is a director of the corporation. Mr. Weiss, manager of the new business of the corporation, began work with the corporation in 1904 as telephone clerk and Mr. Simmons began in 1909 as a messenger, advancing through the various ranks until in 1925 he was made auditor.

JOSEPH B. MCCALL, Jr., who has been connected with the Philadelphia Electric Company during the past decade, has resigned his position as assistant secretary of the Philadelphia Electric Company and secretary of the Philadelphia Electric Power Company and the Susquehanna Power Company (which companies conduct the Conowingo project), and other subsidiary companies, effective Aug. 31, to become associated with a prominent real estate organization in Philadelphia. Mr. McCall's father, the late Joseph B. McCall, was the active and guiding head of the Philadelphia Electric Company for many years.

ERNEST H. WEST, engineering member of the Vermont Public Service Commission, has been elected a member of the Vermont Council.

R. J. SMART has been made commercial manager of the upper northern division of the Central Maine Power Company, covering Dover, Foxcroft, Dexter, Pittsfield and Skowhegan.

E. D. MILLER, district superintendent of the West Penn Power Company at Latrobe, Pa., has been selected to succeed L. E. Van Allen as local manager at Greensburg. L. T. JACKMAN, formerly district superintendent at West Newton, has been appointed to the vacancy at Latrobe.

R. G. HARVEY, who has been connected with the rural service promotion department of the New York Power & Light Corporation, Albany, was transferred to the Syracuse Lighting Company, where he will engage in rural promotion activities for that company.

W. G. DAVIES, JR., has been appointed manager of power sales in Chattanooga for the Tennessee Electric Power Company. Mr. Davies is a graduate of the University of Tennessee in electrical engineering. He entered the employ of the power company in 1923 as power sales engineer, serving in this capacity for the past five years.

L. O. FONVIELLE, for three years manager for the Carolina Gas & Electric Company at Goldsboro, N. C., has been appointed manager of the company's properties in Goldsboro, Kinston and Greenville with headquarters in Kinston. T. Edgar Grace, who has been manager of the New Bern plant, will succeed Mr. Fonvielle.

ARTHUR W. FROST, district manager of the Southern California Edison Company at Porterville, Cal., has been promoted to be district manager of six cities in southern California, including the Huntington Beach oil-producing section. Merritt F. Rhodes has been transferred from Alhambra to succeed Mr. Frost at Porterville.

O. C. SMALL, formerly assistant to the managing director and service manager of the Society for Electrical Development, has been placed in charge of the league and field department as director, with his former service duties transferred to the secretary's department, under the direction of James Smieton, secretary of the society.

G. O. Muhlfeld Heads New Stone & Webster Company

George O. Muhlfeld, vice-president of Stone & Webster, Inc., has been elected president of the new Stone & Webster Engineering Corporation. This corporation has taken over from Stone & Webster, Inc., its construction and engineering business and its interest in Ulen & Company and has also acquired from the North American Company its engineering and construction company, McClellan & Junkersfeld, Inc.

Mr. Muhlfeld has been associated with Stone & Webster since 1903. For the past 21 years he has been one of the principal executives of the construction and engineering branch of the business and since 1919 the chief executive of this branch. Born in Peru, Ind., he attended Purdue and Cornell Universities, then worked on various construction jobs in Chicago, Detroit and Seattle. At Seattle he joined the Stone & Webster organization and was associated with S. Z. Mitchell on the Puyallup River Development, one of the earlier hydro-electric stations built by Stone & Webster.

After completing this project and others, including the Taylors Falls (Minn.) development, he came to the firm's Boston office in 1907. In 1912 he was placed in charge of all construction work. The scope of his activities continued to broaden, and when Stone & Webster became identified with the government shipbuilding program, in 1917, the construction of the Hog Island shipyards was under his personal direction as senior vice-president of the American International Shipbuilding Corporation.

Mr. Muhlfeld then changed his headquarters to the New York office of Stone & Webster, where, in addition to other work, he has had complete charge of all construction and engineering done by the organization.

Besides being president of Stone & Webster Engineering Corporation and vice-president of Stone & Webster, Inc., Mr. Muhlfeld is a director of American Investors Corporation, Engineers Public Service Company, General Public Service Corporation, Grace National Bank, Pennsylvania Power & Light Company, Simms Petroleum Company, Inc., Stone & Webster Associates Corporation, Stone & Webster and Blodget, Inc. and Ulen & Company.

L. E. JONES, who has been connected with the Central Maine Power Company since 1921, has been named eastern division commercial manager. His territory will cover the Rockland, Belfast, Boothbay and Camden districts.

ALFRED V. DE FOREST, research engineer for the American Chain Company since 1918, was recently made the recipient of the Dudley national medal by the National Society for Testing Materials in recognition of his achievement in perfecting the non-destructive test for materials. Magnetic analysis is a subject on which dozens of eminent research engineers have been working for years. The problem involved is thought to be solved through Mr. de Forest's sensitive electric galvanometer, which, it is said, will detect a flaw no bigger than a pinhead in the center of a large steel wheel without cutting or marring the surface of the metal.

HERBERT A. WAGNER, president of the Consolidated Gas, Electric Light & Power Company of Baltimore, has been appointed chairman of the publicity committee for the Community Fund, to be raised in the fall. He also has been named a member of the executive committee and of the campaign committee.

OTTO PRUESSMAN, who has been active for a number of years in the development of General Electric interests in Japan, has been elected a vice-president of the International General Electric Company, Inc. Mr. Pruessman joined the General Electric family in 1919, in which year he was made vice-president and director of the Tokyo Electric Company. He is also a director of the Shibaura Engineering Works of Tokyo. Both of these Japanese companies are affiliated with the General Electric Company of America. In 1927 Mr. Pruessman was made Far East manager of the International General Electric Company for the territory of Japan, China and the Philippine Islands, which position he retains as vice-president.

FRED F. HENSHAW for the past eighteen years district engineer for the United States Geological Survey, Water Resources Branch, Portland, Ore., has been transferred to the staff of the Federal Power Commission at Washington, D. C. G. H. CANFIELD, who has been the principal assistant in the Portland district since September, 1921, has been named to succeed Mr. Henshaw as district engineer.

Obituary

W. D. GUINSLER, owner of the Junction City Light & Power Company, Junction City, Ohio, died at his home in that town July 20, in his fifty-fifth year. Mr. Guinsler had long been active in business and civic affairs.

JOHAN M. ANDERSEN, president of the Albert & J. M. Anderson Manufacturing Company, Boston, Mass., died at his home in Brookline July 25, in his seventy-third year. Mr. Andersen was born in Norway and came to this country 48 years ago. He was a pioneer in the manufacture of overhead line material and molded insulation, designing many of the present-day standards. Many notable achievements in the design and construction of switches and circuit breakers are attributed to Mr. Andersen. He was well known among power plant engineers and held membership in the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, the New York Electrical Society and other similar organizations.

Financial and Statistical News

Electric Investors Issues Report

Electric Investors, Inc., has issued a report for the period ended June 30, 1928, with comparisons for the calendar years 1926 and 1927 and a schedule showing both book value and market value of net assets available for stocks at the end of each of the three periods.

The total excess of market value over book value available for stocks at June 30, 1928, was $29,599,666. This compares with $7,204,464 at Dec. 31, 1926. The book value of net assets per share of preferred stock outstanding at June 30, 1928, was $269.96 and the market value was $467.29. The book value of net assets per share of common stock outstanding at June 30, 1928, was $28.45 and the market value $61.49. The book value of net assets per share of common stock increased from $26.37 at Dec. 31, 1926, to $28.45 at June 30, 1928, whereas the market value increased from $35.43 at Dec. 31, 1926, to $61.49 at June 30, 1928.

The earnings per share of common stock for the twelve months ended June 30, 1928, were $2.95, compared with $2.34 for the twelve months ended Dec. 31, 1926. Surplus of the company increased from $2,244,466 at Dec. 31, 1926, to $5,661,652 at June 30, 1928.

Fairbanks-Morse Issues Quarterly Statement

Income account statement of Fairbanks, Morse & Company, giving the results of the operations of the company for the three months ended June 30, shows net profit for the quarter, after making provision for depreciation, debenture interest and federal taxes, amounting to $594,960. This figure, after deduction of the preferred stock dividend for the period, leaves a balance of $471,089, or $1.28 per share, available for the common stock.

Total orders received from customers for the three months amounted to $8,752,476, as compared with $8,615,811 for the corresponding period in 1927. Shipments to customers for the quarter amounted to $8,142,796, as against $8,371,840 for the similar quarter of 1927. The total of unfilled orders on the books at the close of June was $1,200,000 greater than at the beginning of the year.

New Associated Yearbook Sent to Stockholders

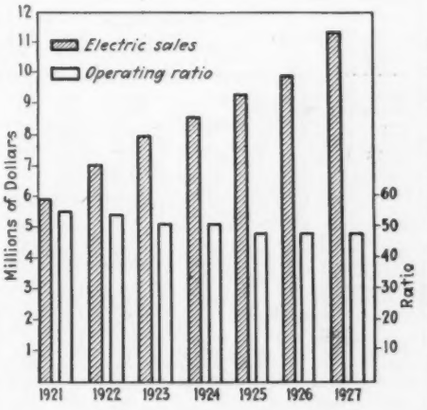
An increase of 72 per cent in customers and of 118 per cent in kilowatt-hour sales from 1921 to 1927 for all properties now in the system is shown in the new Associated Gas & Electric Yearbook just released to stockholders. During 1927 the number of customers increased to over 600,000 and the number of investors increased to more than 61,000, a gain of 13,000 during the year.

A comprehensive map of the diversified areas served and numerous pictures of the more important properties are included in the book. Many of the properties date back to the pioneer days of the electric and gas industry as indicated in a brief historical sketch covering 76 years of growth.

Five important elements which have contributed to the substantial development of the Associated System since its early beginning in 1852 are outlined, namely, diversification, both geographical and as to types of service; group management and supervision; experienced executives; loyal employees and customer ownership of securities.

Kansas City Power & Light Earnings Show Continuous Growth

DURING the year 1927 the Kansas City Power & Light Company continued to maintain the consistent and steady growth which has characterized its financial operations for the past ten years, according to the data contained in the annual report. The gross earnings for the year 1927 increased over those of the preceding year by $1,624,545 and the net earnings for the same period increased $541,029. The greater increase in gross, as compared to the net, is largely due to the fact that the company acquired the Grand Avenue power station of the Kansas City Public Service Company and began serving that company with power in May of 1927.



Spread widens between electric sales and operating ratio trends

Gross earnings for 1927 totaled $12,502,404, as compared with $10,877,859 in 1926, and operating expenses and maintenance totaled $5,161,006, as compared with $4,147,077 for the preceding year, leaving a gross income before taxes of $7,341,398, against $6,730,782 in 1926. After taxes gross income amounted to $6,246,648, as compared with $5,705,618. Surplus available for depreciation and dividends is shown at $4,742,106, as compared with $4,286,045 for the previous year. The accompanying chart shows that the operating ratio has improved each year, except during the war period, when the abnormal costs threw all results out of balance.

The average return per kilowatt-hour has been gradually decreasing since 1919, when it was 3.829 cents per kilowatt-hour, until the year 1927, when the average reached 2.98 cents per kilowatt-hour. The pre-war average was 21.6 per cent and the 1919 average was 28.3 per cent higher than the year 1927. This decrease in the average return per kilowatt-hour has been accompanied by an increase in the net earnings.

The increase in energy generated and purchased since 1917 shows a steady growth and in 1927 the output was approximately 235 per cent in excess of the 1917 output. Less than 0.1 per cent of electric energy was purchased during 1927. The increase in the number of meters in service, totaling 123,551 as of Dec. 31, 1927, reflects the growth of Kansas City and its suburbs, as a majority of the other communities receiving service in the territory covered by the lines of the company obtained it from other companies purchasing wholesale power from the Kansas City company.

The accountant's report showed that expenditures for acquisition of property, permanent additions and betterments for the year were as follows: Electric plant, $5,017,887; heating plant, $167,177; other plants, $13,273; total, $5,198,337.

Allis-Chalmers Earns $5.69 on Common

During the first quarter of 1928 the earnings of the Allis-Chalmers Manufacturing Company were $675,600, compared with $561,460 in 1927; for the second quarter, $804,408 for 1928, compared with $543,237 for 1927, or a total of $1,480,008 for the first six months of 1928, compared with $1,104,698 for the corresponding period of 1927. These earnings are equivalent to $5.69 a share on the stock for the first six months of 1928, compared with $4.27 a share for the first six months of 1927.

The billings for the current half year of 1928 show an increase of 4.96 per

cent over the corresponding period a year ago. Bookings for the half year of 1928 aggregated $17,524,323 compared with $15,110,813 for similar period in 1927, an increase of 15.97 per cent. Unfilled orders on hand June 30, 1928, amounted to $10,148,288 against $10,013,114 on Dec. 31, 1927.

GERMAN UTILITY CALLS SECURITIES.—The Unterelbe Power & Light Company (Elektricitätswerk Unterelbe, Aktiengesellschaft), Germany, has called for payment Oct. 1 next at 103 and interest all of its outstanding fifteen-year 7 per cent sinking fund mortgage gold bonds due Oct. 1, 1941, amounting to $2,500,000.

EASTERN UTILITIES ASSOCIATES PAYS SECOND COMMON DIVIDEND.—The directors of the Eastern Utilities Associates have declared a quarterly dividend of 50 cents per share on the common stock, no par value, payable Aug. 15 to holders of record July 27. An initial quarterly dividend of like amount was paid on this issue on May 15 last.

Survey Shows Substantial Investment in Public Utilities

A total of nearly $26,000,000,000 is now invested in the public utility business of the country, exclusive of the steam railroads, according to a survey made by Bonbright & Company, Inc., New York. The results of the survey are contained in the eighth edition of "Public Utility Points," a booklet prepared by this investment banking house now being distributed free of charge. Of particular interest are the facts relating to the electric light and power industry. Investment in the combined electric light and power and gas industries amounts to approximately $12,500,000,000. This figure compares with about $6,000,000,000 in the electric railways industry, more than $3,800,000,000 in telephone and telegraph companies, and an amount estimated at more than $3,500,000,000 in water supply facilities. The revenues of the electric light and power industry have increased over those of the preceding year every year since its inception in 1882. Gross earnings of all the electric light and power companies in the country in 1902 aggregated approximately $85,700,000 and 25 years later they reached a total of twenty times that sum. On Jan. 1, 1928, the light and power companies had 230,000 employees and 21,694,100 customers.

After an appreciation of the remarkable accomplishments of the industry the booklet discusses its future possibilities in the way of wired homes, electric appliances, electrification of farms, electrified railroads, lighting of the highways and the radio. With this as a basis the booklet makes this prediction:

The field for future development in the electric power and light industry is so great that capital investment is expected to increase by nearly one-third and gross receipts by more than one-half during the next five years alone.

The survey closes with a discussion of the benefits of customer ownership, the favorable operating factors of the industry and the holdings of insurance companies in public utility securities.

RECENT LISTINGS.—The New York Stock Exchange has authorized the listing of 34,931 shares of common stock of

Stock Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday July 31	Low 1928	High 1928
ABITIBI PWR. & PAPER, com. $4—no par	50½	47	85
Ala. Pwr., $7 cum. pf.—no par	*m* 114	114½	115½
Allis Chalmers Mfg., 7% com.	126	115½	129½
Aluminum Co. of Amer., com.	135	120	197½
Aluminum Co. of Amer., 6% pf.	107½	105½	110½
Amer. & Foreign Pwr. 7% pf.—no par	108½	104½	110
Amer. & Foreign Pwr., com.—no par	34½	22½	38½
Amer. Bosch Magneto, com.—no par	30½	15½	41
Amer. Brown Boveri Elec.†	14½	10½	26½
Amer. Brown Boveri Elec., pf. $7	51½	40½	65½
Amer. Gas & Elec., 6% pf.—no par	105½	104½	111
Amer. Gas & Elec., com. $1—no par	165	117½	184
Amer. Lt. & Trac., 6% pf.	118	116	120
Amer. Lt. & Trac., 8% com.	217½	170	249
Amer. Pwr. & Lt., 6% pf.	102½	102	107½
Amer. Pwr. & Lt., com.†—no par	78½	62½	95
Amer. Pub. Serv., 7% pf.	*a* 10	97½	104
Amer. Pub. Serv., com.†	*m* 60	...	...
Amer. Public Utilities, 7% ptc. pf.	*a* 93½	93½	101
Amer. Public Utilities, 7% pr. pf.	*a* 93½	93½	101
Amer. Public Utilities, com.	*m* 50	...	...
Amer. States Sec., A	*a* 10½	4	13½
Amer. States Sec., B	*a* 14	4½	17½
Amer. Superpower, 6% 1st pf.	*l* 98	...	...
Amer. Superpower, Class A†—no par	35	33½	56
Amer. Superpower, Class B†—no par	35½	35½	56½
Amer. Wtr. Wks. & Elec., 6% pf.	*m* 101	100	106
Amer. W. W. & E., $1 com.—no par	58½	52	70½
Anaconda Copper cap. $4	67½	53½	74½
Appalachian Electric Pwr., 7% pf.	106	105	110
Arkansas Pwr. & Lt., 7% pf.	106	105	109½
Assoc. Gas & Elec., $3.50—50	52½	...	...
Assoc. Gas & Elec., pf.—$6—no par—ex. div.	96	96	98½
Assoc. G. & E., Class A, 10—no par	48½	47	52½
BABCOCK & WILCOX, 7% com.	120	118	127
Binghamton L., H. & P., $6 pf.	100	102	109½
Birmingham Elec., pf.—$6—no par	107	104	107
Blackstone Valley G. & E., 6% pf.	*m* 105	106	112
Blackstone Valley Gas & Elec., 10% com.—50	*m* 165	135	170
Blaw-Knox com. $3	*k* 102½	91	108
Brazilian Trac., Lt. & Pwr. com., 1.76	*f* 54½	...	...
Broad River Pwr., 7% pf.	103	105	108½
Brooklyn Edison, 8% com.	*m* 241	206½	268½
Buffalo, Niagara & East. Pwr., $1.60 pf.—25	*l* 26½	...	...
Buffalo, Niagara & East. Pwr. com. $1.20—no par	*l* 43	...	...
CALIFORNIA ELEC. GENERATING, 6% pf.	99	98	101
Carolina Pwr. & Lt. pf.—$7—no par	*l* 108½	109	111
Central & S. W. Util., $7 pf.—no par	*a* 101	99½	105½
Central & S. W. Util., pr. in. $7 pf.—no par	*a* 105½	102½	112
Central Ark. Ry. & Lt., 7% pf.	102	105	107½
Central Ill. Pub. Serv., $6 pf.	*a* 97½	97½	100½
Central Ind. Pwr., 7% pf.	*a* 100	95	101½
Central Maine Power, 6% pf.	97	96	98½
Central Maine Power, 7%	110	104½	121½
Central Pwr. & Lt., 7% pf.	104	104½	114
Central States Elec., 7% pf.	115	104½	121½
Century Electric com.	*m* 130	130	145
Cincinnati Gas & Elec., 5% com.	97½	97½	100½
Cities Service, $6 pf.—no par	*l* 99½	94½	103½
Cities Service, pf. B—no par	*l* 9½	8	9½
Cities Service, pf. BB—no par	*l* 94	88½	97
Cities Service, com.—20	*l* 66	54	70½
Cities Service, Bks. Shrs.—10	*l* 32½	26½	35½
Cities Service Pwr. & Lt., 7% pf.	*m* 106½	106	109½
Cities Service Pwr. & Lt., 6% pf.	99½	95	102
Cleveland Elec. Illg., 6% pf.	109½	109	115½
Cleveland Elec. Illg., 10% com.	425	350	425
Columbia Gas & Elec., 6% pf.	*m* 107½	106	110½
Columbia G. & E. com. $5—no par	111½	89½	118½
Columbus Elec. & Pwr., 7%	110	...	...
Columbus Ry., Pwr. & Lt., 6% pf.	104	107	111
Columbus Ry., Pwr. & Lt., 6½% pf. B	103	105	111
Columbus Ry., P. & Lt., com. no par	125	120	125
Commonwealth Edison, 8% com.	*a* 183	165	189
Commonwealth Pwr., 6% pf.	100	100	104½
Commonw'th Pwr., $3, com.—no par	77½	62½	87½
Conn. Lt. & Pwr., 8% pf.	117	120	123
Conn. Lt. & Pwr., 7% pf.	116	118	121
Cons. Gas of N. Y., $5 pf.	100½	100½	105
Cons. Gas of N. Y., com. $5—no par	147½	119½	170½
Cons. Gas, Elec. Lt. & Pwr. of Baltimore, 6% pf.	*e* 110½	109½	114½
Cons. Gas, Elec. Lt. & Pwr. of Baltimore, 5% Pf.	*e* 102½	100	105½
Cons. Gas, Elec. Lt. & Pwr. of Baltimore, com. $3.00—no par	*e* 82½	67½	93
Consolidated Power & Lt., 7% pf.	105	106	109
Consumers Power, 6% pf.	103½	104	106½
Consumers Power, 6.6% pf.	104	104	108½
Continental Gas & Elec., 7% pr. pf.	105	105	108½
Conti. G. & E. com. $4.40—no par	*m* 225	240	265
Crocker Wheeler, com.†	80	23	85
Crocker Wheeler, 7% pf.	97	77	100
DALLAS PWR. & LT., 6% pf.	110	110	111½
Dayton Pwr. & Lt., 6% pf.	107½	107	110½
Derby Gas & Elec., 7% pf.	97	96	100½
Detroit Edison, 8% com.	197	166½	209½
Dubilier Condenser, com.—no par	2½	2½	5½
Duke Pwr., 4% com.	135½	130	148½
Duquesne Lt., 5% pf.	101	100½	105½
EASTERN NEW YORK UTIL., $7 pf.	*m* 110	111	112½
Eastern States Pwr. B	*m* 18	12	24
Eastern States Pwr., pf.	*m* 100½	98	100½
East. Tex. Elec., 7% pf.	107	106	109
Edison Elec. of Boston, $12 com.	*d* 279	252	305
El Paso Elec. 7% pf.	*m* 111½	110	112½
Elec. Bond & Share, 6% pf.	110	108½	111½
Elec. Bd. & Sh. Sec., com. $1—no par	98½	76	127½
Electric Household Util.†	*a* 26½	13½	27
Elec. Investors, 6% pf.—no par	97	101	104½
Elec. Investors, com.†—no par	61	40½	79½
Elec. Pwr. & Lt., ctfs. 7% pf.	107½	106½	110½
Elec. Pwr. & Lt., ctfs., com.—no par	34½	28½	45½
Elec. Ry. Securities, com.—no par	6½	...	...
Elec. St. Battery com. $5.25—no par	77½	69	84½
Elmira Wtr., Lt. & R.R., 7% pf.	105	104	115
Empire Pwr., ptc., $2	32½	27½	39½
Engr. Pub. Serv. $5, pf.—no par	*m* 97	97	102
Engr. Pub. Serv., com.—no par	37½	33	46½
Eureka Vacuum Cleaner, com. $4—no par	*m* 60	60½	79
FAIRBANKS MORSE, 7% pf.	*m* 112	104	114½
F.-M., com.—$3—no par	45½	32½	54
Federal Lt. & Trac., com. $1.40	*m* 51½	42	56½
Federal Lt. & Trac., $6 pf.—no par	*m* 102½	98	109
Florida Pwr. & Lt., 7% pf.	*m* 102	103	108
Ft. Worth Pwr. & Lt., 7% pf., ex. div.	*l* 112	113	114½
GALVESTON-HOUSTON ELEC. 6% pf.	77	75	85
Galveston-Houston Elec., com.	33	31	34
General Cable, Cl. A	66½	56	84½
Gen. Elec. $4 com.—no par	152½	124	174½
Gen. Elec., special—6%	11½	11½	11½
Gen. Gas & Elec. (Del.), com. A $1.50 no par	55½	35½	56½
Gen. G. & E. (Del.) pf. A. $8—no par	135	125	144
Gen. G. & E. (Del.) pf. A $7—no par	118	110	120
Gen. G. & E. (Del.) pf. B $7	114	104	117
Gen. Pub. Serv., $7 pf.	*m* 123	115	140
Gen. Pub. Serv., com., no par	23½	16½	29
General Public Utilities, $7 pf.	*m* 96	98	103
Ga. Lt., Pwr. & Rys., com.	*m* 58	55	65
Gt. Western Pwr., 7% pf.	*l* 105	...	...
IDAHO PWR., 7% pf.	109	109	111½
Ill. No. Utilities, 6% pf.	*a* 100	98½	101
Ill. Pwr. & Lt., $6 pf.	106½	103	107
Indianapolis Pwr. & Lt., 6½% pf.	*m* 103½	102	107½
Indianapolis Pwr. & Lt., $7 pf.	99	100	105
Ingersoll Rand com. $3	92½	90	98
Int. Combus. Engr., com. $2—no par	60½	45½	72½
Int. Combustion Engr., 7% pf.	103½	103	109
Int. Util., Class A—$3.50—no par	45½	44½	52
Int. Utilities, Class B—no par	16	6½	19½
Interstate Pwr., pf.—$7—no par	97½	99	105
Interstate Pub. Serv., 7% pf.	106	103	108
Iowa Ry. & Lt., 7% pf.	*m* 101	102	103
JERSEY CENTRAL PWR. & LT. CO., 7% pf.	103	105	107
Johns-Manville, com. $3—no par	117½	96½	134

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f*Montreal; *g*Cincinnati; *h*San Francisco; *i*Pittsburgh; *j*Washington; *k*Cleveland. *l*Bid price Wednesday, Aug. 1. *m*Bid price Saturday, July 28. *n*Latest quotations available. †Dividend rate variable.

Stock Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday July 31	Low 1928	High 1928
KANSAS CITY POWER & LIGHT			$
$6 pf.	*m*108	108¼	114
Kansas Gas & Elec. 7% pf.	*l*110	107	110
Kelvinator Corp.	11¼	7¼	22¼
Kentucky Hydro-Elec., 7% pf.	*m*103	100	105
Kentucky Sec., 6% pf.	90	90	98
Kentucky Sec., 5% com.	150	140	150
Kentucky Utilities, 6% pf.	105	100	105
LACLEDE GAS LT., 10% com.	*m*210	200	260
Long Island Ltg., 7% pf	*m*108½	109	112½
Long Island Ltg., 6% pf	*m*103	104	109
Long Island Ltg., com. $3—no par	*m*250	170	250
Los Angeles Gas & Elec., 6% pf.	106	105¼	112½
Louisville Gas & Elec., cl. A. $1.75	34½	28	41
MAN. ELEC. SUPPLY, cap. $5—no par	59	50	66½
Maytag Co., com. $1.50—no par	*m* 18½	18½	22
Memphis P. & L., pf.—$7—no par	110	109	111
Metropolitan Ed., pf.—$6—no par	103½	103	109½
Metropolitan Ed., pf.—$7—no par	108½	109	111½
Metropolitan Ed., com. $5—no par	*m*160	125	185
Middle West Utilities, 6% pf.	*a* 97½	93¼	100½
Middle West Util., 6% pr. lien	*a*102	99	108
Middle West Util., com. $7—no par	*a*143½	123½	169
Midland Utilities, pr. ln. 6% pf.	*a* 94	93	97
Midland Utilities, 7% pf. A	*a*101½	98½	105½
Milwaukee Elec. Ry. & Lt., 7% pf.	105	100	106
Milwaukee Elec. Ry. & Lt., 6% pf.	100	98	110
Minn. Pwr. & Lt., 7% pf.	*l*108	107	109
Miss. River Pwr., 6% pf.	108	94	112½
Mohawk Hudson Pwr., 1st pf.—$7—no par	*m*1 8	100	110
Mohawk Hudson Pwr., 2d pf.—$7—no par	*m*102	100	109
Mohawk Hudson Pwr. com.—no par	37½	29½	53
Montana Pwr., 6% com.	*m*147	102½	175
Montreal Lt., Ht., & Pwr. com. $2—no par	*f*104½	....	....
Mountain States Pwr., 7% pf.	*m*101	97	105
Mountain States Pwr., com.†	17	....	....
NASSAU & SUFFOLK LTG., 7% pf.	108	98	110½
National Carbon, 8% pf.	*n*136	136	139½
National Elec. Pwr., A†	*a* 33½	27½	42
National Pwr. & Lt., pf. 7%	108½	106½	111
National Pwr. & Lt., com.†—no par.	33½	21½	36½
National Pub. Serv., 7% pf.	98½	99	104
National Pub. Serv., A com. $1.60—no par	24½	22	29½
National Pub. Serv., B com.—no par	*n* 30½	24½	32½
Nebraska Pwr., 7% pf.	*l*109	110	111½
Nevada-Calif. Elec., com.	*n* 53	33½	53
New Brunswick Pwr., 4% pf.	*m* 60	60	70
New Eng. Pub. Serv., pf. $6	110	98½	110½
New Eng. Pub. Serv., pf. $7	*m* 103	95	108
New Orleans Pub. Serv.—7% pf.	106½	106	110
N. Y. & Queens Elec. Lt. & Pwr., 5% pf.	102	91	104
N. Y. Central Elec., 7% pf.	105	101	107
New York Power & Light 7% pf.	112	....	....
No. Amer., 6% pf.—50	54	53½	55½
No. Amer., com.—10	72½	58½	78½
No. Amer. Edison, $6 pf.—no par	101½	100½	105½
Northeastern Pwr., com. $1	25½	19½	31
No. N. Y. Utilities, 7% pf.	107	103	109
No. Ohio Pwr., com.—no par	27½	18	32
Northern Ohio Pwr. & Lt., 6% pf.	100	90	100
No. Ont. Lt. & Pr. 6% pf.	*m* 98	94	100
No. States Pwr. (Del.), 7% pf.	109	108½	110½
No. States Pwr. (Del.), 8% com.	134½	123	152
No. Texas Elec., 6% pf.	50	45	70
No. Texas Elec., com.	14	....	....
OHIO BRASS, com. B $5—no par.	90	90	100½
Ohio Brass, 6% pf.	*m*104	106	111
Ohio Pwr., 6% pf.	108	104	109½
Ohio Pub. Serv., $6 pf.	104	95	105
Ohio Pub. Serv., 7% pf.	111	107	112
Ohio River Edison, 7% pf.	107½	106	109½
Oklahoma Gas & Elec., 7% pf.	110½	106	115½
PACIFIC GAS & ELEC., 6% pf.	27½	26½	30
Pacific Gas & Elec., $2 com.	47½	43½	53½
Pacific Pwr. & Lt., 7% pf.	109½	106	110
Packard Electric, com. $2.80	85	47	85
Penn Cent. Lt. & Pwr., $5 pf.—no par	*c* 79	78	82
Penn-Ohio Edison, $6 pf. no par	96	92	101
Penn-Ohio Edison, 7% pf.	107½	104½	109
Penn-Ohio Pwr. & Lt., 7% pf.	107	....	....
Penn Pwr. & Lt.—$7—no par	*l*109	109½	110½
Penn Wtr. & Pwr., $2.50 com., new	*e* 80	68	80
Phila. Co., 5% pf.-50	*m* 47	45½	48½
Phila. Co., 6% pf.—50	52½	52	57
Phila. Co., $4 com.—50	*m*160	145	174½
Phila. Elec., $2 com.—25	*c* 65½	55½	74½
Portland Elec. Pwr., 7% pf.	102½	100	106
Portland Elec. Pwr., 6% pf.	93	78	96
Portland Elec. Pwr., 6% 2d pf.	83	55	88
Portland Elec. Pwr., com.	43	....	....
Potomac Elec. Power, 6% pf.	*l*111½	....	....
Pwr. Sec., pf.—no par	60	50	68
Public Serv. of Colorado, 7% pf.	107	....	....
Pub. Serv. of N. J., 6% pf.	*m*106	103½	115
Pub. Serv. of N. J., 7% pf.	125	118	129½
Pub. Serv. of N. J., $2 com.—no par	55½	41½	66½
Pub. Serv. of No. Ill., 6% pf.	*a*120½	110	120½
P. S. of No. Ill., com. $8—no par	*a*186½	159½	190½
Pub. Serv. of No. Ill., $8 com.	*a*186	139½	190
Pub. Serv. of Okla., 7% pr. ln.	109	100	107
Pub. Serv. Elec. & Gas, 6% pf.	*m*108½	107½	110½
Puget Sound Pwr. & Lt., 7% pf.	*m*110	105	110
Puget Sound Pwr. & Lt., 6% pf.—no par	98	92	105½
Puget Sound Pwr. & Lt., com.	30½	34½	94½
RADIO CORP. OF AMER., $3.50 pf.—50	*m* 56	54½	60
Radio Corp. of Amer., com.—no par.	175½	85½	224
Rochester Gas & Elec. 6% pf. D	105½	105½	106½
Rochester Gas & Elec., 7% pf. B	107	105	108
Rochester Gas & Elec., 6% pf. C	104½	105½	106½
SAN JOAQUIN Lt. & Pwr., 7% pr. pf.	117	110	117½
St. Joseph Ry., L., H. & P., 5% pf.	*m* 75	70	75
Servel, Inc.	12½	4½	17½
Shawinigan Water & Power, com.—$2 no par	*f* 90	....	....
Sierra Pacific Elec., 2% com.	*m* 45	29	49½
Sioux City Gas & Elec., 7% pf.	104½	100	108½
Southeastern Pwr. & Lt., pf.—$7 no par	*l*106½	....	....
Southeastern Pwr. & Lt., pfc. pf., $4	*l* 87	....	....
Southeastern Pwr. & Lt., $1 com.—no par	50	40½	61
So. Calif. Edison, 8% pf.	47½	43½	53½
So. Calif. Edison, 7% pf.	29	27½	29½
So. Calif. Edison, 6% pf.	27	25½	28
So. Calif. Edison, $2 com.	47	43½	53½
Southern Cities Utilities, 7% pf.	83	75	92
Southwestern Lt. & Pwr., A $3	65	60	80
Southwestern Lt. & Pwr., B	50	....	....
Southwestern Lt. & Pwr., $6 pf.	90	....	....
Southwestern Pwr. & Lt., 7% pf.	*m*110	103	115
Standard Gas & Elec., 8% pf.	66½	65	71½
Standard Gas & Elec., 7% pr. pf.	110	108	115
Standard G. & E., com. $3.50	64	57½	74½
Standard Power & Light, com.	*m* 47	29½	58½
Standard Pwr. & Lt., 7% pf.	*m*102	98	106
Staten Island Edison, pf.—$6—no par	100	99	103½
Superheater, $6 com.—no par	148	150	175
Syracuse Lighting, 7% pf.	110	103	112½
Syracuse Lighting, 8% pf.	*m*120	114	121
TAMPA ELEC., com. $2	*m* 63½	62	71
Tenn. Elec. Pwr., 6% pf.	99	92	103
Tenn. Elec. Pwr., 7% pf.	106	107	110
Tex. Pwr. & Lt., 7% pf.	*l*112	113½	115
Tide Water Pwr., 8% pf.	107	108	112
Timken Roller Bear., com.—$4 no par	126½	112½	134
Toledo Edison, 7% pf.	109	108	111
Toledo Edison, 6% pf.	105	95	105
Toledo Edison, 6% com.	*m*145	120	150
Tri-City Ry. & Lt., 6% pf.	90	88	102
UNITED GAS & ELEC., 7% pf.	96½	98	103
United Gas & Elec. (N. J.), 5% pf.	75	70	77
United Gas Impr., $4 com.—50	*c*138	114½	149½
United Lt. & Pwr., pf.—$4—no par.	*m* 55	49	56½
United Lt. & Pwr., pf.—$6.50—no par	*a* 98½	94½	103½
United L. & P., com. A .48—no par.	*m* 25½	13½	27½
United L. & P. com. B .48—no par.	*m* 32	20	37
Utah Pwr. & Lt., 7% pf.	*l*108	109½	112
Utica Gas & Elec., 7% pf.	106	105	107
Utica Gas & Elec., 8% com.	*m*200	215	225
Utilities Pwr. & Lt., 7% pf.	98½	98	104
Utilities Pwr. & Lt., com. A $2	*n* 38½	13½	27½
Utilities Pwr. & Lt., com. B $1—no par	28½	18½	32½
VERMONT HYDRO-ELEC., 7% pf.	99	95	102
Virginia Elec. & Pwr., 7% pf.	*m*108	108	111
Virginia Public Service 7% pf.	104	97	103½
WAGNER ELEC., 7% pf.	*b*104	96½	107
Wagner Elec., com.—no par	*b* 94½	37	120
Washington Ry. & Elec., 7% com.	*f* 450	....	....
Washington Ry. & Elec., 5% pf.	*f* 99½	....	....
Washington Wtr. Pwr., 8% com.	225	175	235
West Penn Elec., 7% pf.	111	108	115
West Penn Elec., 6% pf.	100½	98½	104½
West Penn Pwr., 7% pf.	115	114½	118
West Penn Pwr., 6% pf.	*m*105½	103	113
West Virginia Lt., Ht. & Pwr., 7% pf.	95	94	100
Western Pwr., 7% pf.	104	98	105
Western States Gas & Elec., 7% pf.	*m* 99	100	106
Westinghouse Elec. & Mfg., $4 com.—50	95½	88½	112
Weston Elec. Instrument, Cl. A $2—no par	32½	30½	36½
Weston Elec. Instrument, com.—no par	22½	12½	28½
Wheeling Elec., 6% pf.	106	95	109
Worthington Pump, 7% pf. A	56½	46½	58½
Worthington Pump, 6% B	48	41	51
Worthington Pump, com.	39½	28	40½
YALE & TOWNE com., $4—25,	*m* 67	67	84½

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f*Montreal; *g*Cincinnati; *h*San Francisco; *i*Pittsburgh; *j*Washington; *k*Cleveland. *l*Bid price Wednesday, Aug. 1. *m*Bid price Saturday, July 28. *n*Latest quotations available. †Dividend rate variable.

the American Water Works & Electric Company (no par value) on official notice of issuance as a stock dividend, making the total amount applied for 1,451,046 shares. The Baltimore Stock Exchange has authorized the listing of $375,000 additional first mortgage 5½ per cent gold bonds of the Lake Ontario Power Corporation. The New York Stock Exchange has also authorized the listing of 12,300 shares of class A stock of the General Cable Corporation (no par value) and not exceeding 17,500 shares of common stock (no par value), on official notice of issuance in exchange for property of the Detroit Insulated Wire Company, or on official notice of issuance and payment in full; with authority to add to the list 24,600 shares of common on conversion of class A on the basis of two shares of common in exchange for one share of class A.

New England Gas & Electric Issues First Report

The first annual report of the New England Gas & Electric Association and its subsidiary companies for the fiscal year ended Dec. 31, 1927, was made public in New York this week at the offices of the Associated Gas & Electric System, with which the association is affiliated. In the year the association acquired almost all the common or voting stocks of the Cambridge Electric Light Company, the Cambridge Gas Light Company, the Worcester Gas Light Company, the Cape & Vineyard Electric Company, the New Hampshire Gas & Electric Company and the Middlesex County Electric Company. Proceeds from the sale of an issue of $17,000,000 5 per cent bonds were used for the purchase of underlying securities of the operating companies and for retirement of current indebtedness incurred in the purchase of properties and other corporate purposes.

In the first annual report is the consolidated balance sheet showing as at the end of the year total assets of $54,877,736, of which plants and properties are carried at $49,922,331. Current assets are shown as $3,094,290, as compared with current and accrued liabilities of $1,804,111. Operating revenues amounted to $5,075,677, while other income was $164,589. After operating expenses, maintenance and taxes, there was gross income of $1,796,417. After all other deductions, including interest, preferred stock dividends and depreciation, there remained a net income of $1,095,434 for other dividends and surplus.

Investment—Not Speculation

EMPHASIZING the fact that public utility securities represent an investment rather than a speculation, Samuel Insull, in addressing the investors of America under the auspices of Halsey Stuart & Company through the medium of the National Broadcasting Association recently, summarized the question to be asked by a prospective investor thus:

1. Does the company whose security you are considering operate in a productive territory with reasonable prospects for growth?

2. Is the company's property adequate, in extent and physical condition, for the demands upon it?

3. Is the management of the company alert, enterprising, competent and honest?

4. Are the industrial and public relations of the company satisfactory—does it get along harmoniously with its employees, and with the public? For if these relations are good, the company is not likely to be politically harassed.

In conclusion, Mr. Insull said:

When these four questions and those naturally collateral to them can be answered in the affirmative, the securities of the public utility industry are rightly held to be preferred investments.

In soundness and strength, they are second only to federal, state and local government bonds, and they yield generally a considerably better return.

Large Funded Debt Reflects Stability of Utility Industry

According to an analysis made by the Bureau of Business Research of the University of Illinois the large funded debt appearing in the average public utility company's financial statement is indicative of the stability of the industry. The bureau analyzed the statements of more than 1,500 companies. The following tabulation compiled by the bureau showed the ratios of long-term debt, current liabilities, capital and surplus and reserves, each to total equities, for the three types of company, gas and electric, traction, and holding. The proportion of these items to total liabilities offset against total equities was expressed in percentages. There were also made interesting comparisons of the percentages of the various liabilities to the total equities of utility companies of varying size. For the purpose the analysts divided the companies studied into three groups, the first comprising those with total equities of between $5,000,000 and $9,000,000, the second those with equities between $10,000,000 and $40,000,000 and the third those with $50,000,000 and more.

RATIOS TO TOTAL EQUITIES

	Electric and Gas	Traction	Holding
Long-term debt	0.508	0.420	0.473
Current liabilities	0.035	0.031	0.026
Capital stock	0.405	0.472	0.452
Surplus and reserves	0.052	0.077	0.049
	Percentages		
Long-term debt	50.8	42.0	47.3
Capital stock	40.5	47.2	44.2
Surplus and reserves	5.2	7.7	5.9
Current liabilities	3.5	3.1	2.6
Total	100.0	100.0	100.0

OHIO RIVER EDISON INCREASES CAPITALIZATION.—The Ohio River Edison Company has increased its 7 per cent cumulative preferred stock from 60,000 to 120,000 shares of $100 par value and its no-par common stock from 300,000 to 600,000 shares.

MASSACHUSETTS UTILITY INCREASES CAPITAL.—The Massachusetts Department of Public Utilities authorized the Eastern Massachusetts Electric Company, Salem, to increase its capital stock by the issuance of 14,440 shares, par $25, at a price of $35 a share. Proceeds are to be used in the payment of promissory notes.

MASSACHUSETTS COMPANY CHANGES PAR.—The Massachusetts Department of Public Utilities has authorized the Webster & Southbridge (Mass.) Gas & Electric Company to change the par value of its capital stock from $100 to $25 and to offer an additional stock issue of $400,000.

INVESTMENT HOUSE ISSUES REVISED PUBLICATION.—A valuable publication in the financial field has just been issued by James H. Oliphant & Company under the caption of "Studies in Securities," second issue. This booklet discusses 56 companies, dealing with them both from the investment and speculative standpoint, and the 56 chosen, in the opinion of the publishers, are those which perhaps best present a cross section of the commercial activity of the country. The analyses presented are very informing. The writer goes into all factors relating to the capital structure of the companies concerned, deals with the operating positions and gives a careful background of earnings, showing what the company's record has been, both in earnings and in payment on common stock over a period of years. The investor is thus given a brief résumé of the company's position without searching through a very much larger volume of statistics and records. Among the companies analyzed in this record issue are: Allis-Chalmers Manufacturing, American Telephone & Telegraph, Columbia Gas & Electric, Consolidated Gas of New York, Detroit Edison, General Electric and Public Service Corporation of New Jersey.

New Financing in July Negligible

DURING the month of July the electric light and power companies of the country offered new securities to the meager amount of $4,345,000, only four individual offerings having been made. The Central West Public Service Company was responsible for two issues, both in the form of first lien gold bolds, the combined issues making a total of $2,050,000. This figure represents the lowest monthly total ever recorded. The summer period has always been characterized by a falling off in new financing, but never to this low level. It is quite evident that the stock market has not yet recovered from the crash which occurred in June and this condition, coupled with the high rates prevailing, militated against the floating of new loans.

Security Issues of Electric Service Companies in July

Name of Company	Amount of Issue (Par Value)	Period, Years	Class	Purpose	Interest Rate	Price	Per Cent Yield
Central West Public Service Co.	$1,400,000	28	First lien collateral gold bonds, series B	To reimburse treasury for cost of purchased property, additions and extensions and for other corporate purposes	5½	98	5.65
	650,000	30	First lien collateral gold bonds, series A		..	..	....
Interstate Public Utilities Corp.	1,600,000	1	First lien collateral gold notes, series A	To complete the financing necessary for acquisition of the properties of the company and to provide additional working capital	5	99	6.04
Gulf States Service Co.	695,000	10	First mortgage sinking fund gold bonds	Construction	6½	100	6.50
Total	$4,345,000 (par value)		Rights		$28,334,176		
Total amount actually realized	$4,288,000		Total financing for July		$32,622,176		

Business News and Market Conditions

Simplified Practice for One-Piece Insulators

Simplified practice recommendation No. 73, covering one-piece porcelain insulators, has been issued by the United States Department of Commerce. In accordance with the unanimous action on June 3, 1927, of a general conference of representative manufacturers and users of one-piece porcelain insulators, the United States Department of Commerce, through the Bureau of Standards, recommends that stock varieties of this product be limited to those listed in a table which was developed at the conference and which is published in the department's recommendation No. 73.

The recommendations are to be effective for new production from Oct. 1, 1927, and are subject to annual revision by a conference of the standing committee of the industry. While the conference believes that further eliminations could be made without detriment to any one, it felt that this first application of the principles of simplified practice to porcelain insulators was sufficient in scope to bring the industry measurably closer to those ultimate standards which will best serve all interests. The opinion was also expressed that the successful operation of this program would not only pave the way for further eliminations later on but would stimulate other branches of the electrical industry to abandon superfluous varieties.

The standing committee of the industry will receive all comments and suggestions for the improvement of the recommendation and at the expiration of one year from the effective date will meet to consider what changes, if any, should be made. The action of the standing committee will then be resubmitted to the industry for approval. The members of the committee are:

Manufacturers: H. R. Holmes (chairman), R. Thomas & Sons Company, East Liverpool, Ohio; P. S. Corey, Ohio Brass Company, Mansfield, Ohio; S. W. McChesney, Porcelain Products, Inc., Findlay, Ohio (representing the National Electrical Manufacturers' Association).

Users: George A. Rust, C. H. Tenney & Company, Boston, Mass. (representing the National Association of Purchasing Agents, New York); J. A. Brundige, Electric Bond & Share Company, New York (representing the National Electric Light Association), and E. P. Goucher, Capitol Traction Company, Washington, D. C. (for the American Electric Railway Association).

Creosoted Pine Poles Increase in Use

Pressure creosoted Southern pine poles again showed a greatly increased demand in 1927, according to figures just released by the United States Forest Service, prepared in co-operation with the American Wood Preservers' Association. Pine poles treated in 1927 almost equaled the total number of poles of all other species treated in that year. The past ten years has seen an increase of almost 2,500 per cent in the number of Southern pine poles treated. The yearly increase during that time is shown in the accompanying table.

1918	67,541	1923	451,852
1919	156,346	1924	899,201
1920	167,289	1925	780,248
1921	224,777	1926	925,929
1922	291,991	1927	1,738,839

Market and Quotation Service on Metals

Prices of the basic non-ferrous metals are included in a market and quotation service on metals and non-metallic minerals furnished by the *Engineering and Mining Journal*. A special service consists of distributing, by mail or air mail, advance proofs of the market pages, supplemented by advance information as to volume of sales and as to prices and averages via telephone, telegraph or cable immediately upon compilation. The data on the non-ferrous metal market appearing in each issue of the ELECTRICAL WORLD are taken from this *Engineering and Mining Journal* market service. The service developed through 67 years of the existence of the paper consists of the weekly publication of information and comment on market conditions and current quotations on every important ore, metal and unmanufactured mineral product, except solid and liquid fuels.

About 95 per cent of all the copper, approximately 80 per cent of the lead and 50 per cent of the Prime Western zinc sold in the open market in the United States are reported to the *Engineering and Mining Journal* editors. The larger buyers and sellers give the editors specific and exact information as to dates, tonnages, time of delivery and prices of metals sold or purchased by them. No other agency has access to data that in any degree approach these in completeness and accuracy, and no other quotations can be compared for authoritativeness with those published by the *Engineering and Mining Journal*.

Electric Industrial Trucks and Tractors

June shipments of electric industrial trucks and tractors, as reported to the Department of Commerce by the nine leading manufacturers in the industry, were 117, as compared with 116 in May and 140 in June, 1927. The accompanying table gives the shipments for 1927 and for 1928 up to and including June.

SHIPMENTS OF ELECTRIC INDUSTRIAL TRUCKS AND TRACTORS
(In number of vehicles)

		—Domestic—		
1927	Total	Tractors	All Other Types	Exports
January	90	6	67	17
February	138	11	120	7
March	116	10	96	10
April	105	12	89	4
May	106	19	77	10
June	140	20	97	23
Total (six months)	695	78	546	71
July	90	12	73	5
August	92	3	87	2
September	79	8	66	5
October	109	11	81	17
November	98	15	64	19
December	96	8	77	11
Total (year)	1,259	135	994	130
1928				
January	112	5	98	9
February	119	15	86	18
March	131	18	97	16
April	137	9	122	6
May	116	8	95	15
June	117	6	97	14
Total (six months)	732	61	595	76

Destination of Electrical Exports (May, 1928)

Country of Destination	May, 1928 Values
EUROPE:	$1,954,275
Belgium	104,978
France	163,824
Germany	131,196
Italy	151,861
Netherlands	119,079
Spain	124,652
Sweden	71,649
United Kingdom	630,877
Other countries	456,159

Country of Destination	May, 1928 Values
WESTERN HEMISPHERE:	$5,458,455
Canada	2,521,426
Mexico	397,077
Cuba	294,261
Argentina	622,541
Brazil	431,852
Chile	392,743
Colombia	210,761
Peru	38,485
Venezuela	74,871
Other countries	474 438

Country of Destination	May, 1928 Values
ASIA, AFRICA, AND OCEANIA:	$2,438,231
British India	298,675
China	150,984
Japan	745,952
Philippine Islands	241,772
Australia	531,328
New Zealand	144,417
Union of South Africa	73,656
Other countries	251,447

Market Conditions

POWER equipment is in active demand in the New England district and includes a 12,500-kw. turbogenerator to be installed in the Edgar station of the Boston Edison Company and to operate at 1,200 lb. pressure. Transmission line material is moving in good volume, particularly in eastern Massachusetts and southern New Hampshire. The sales volume has been slightly reduced in the New York district, though inquiries continue on a satisfactory basis. There are prospects of sizable orders being placed in the East for switching equipment for heavy line service. In the Southeast activity is sustained. A paper mill in Alabama is expected to place orders this week for $300,000 worth of equipment. Hydroelectric apparatus amounting to $110,000 was ordered for a power development in South Georgia.

During June a general improvement was noticed in business and it is reported that this activity continued in July. One company reports an increase in unfilled orders as compared with the end of 1928 and another company reports a higher weekly average of sales in 1928 than for the same period in 1927. Motor and transformer sales are good in the St. Louis district, and some fair-sized shipments of line construction materials are reported. Business is good in the Middle West and jobbers' sales are increasing. On the Pacific Coast buying was light, but prospects are good and include $100,000 worth of synchronous condensers and $1,000,000 worth of transformers.

Copper and Zinc Sales Active in Metal Market

Copper and zinc sales have been active in the non-ferrous metal market. Copper has been in good midsummer demand. The total sales of zinc have been the largest for many weeks, though the market has not been considered active. Copper buying has not been up to the rate of production in the last week, but nevertheless it has been considerably better than it was in the week before, and perfectly satisfactory to the sellers. Manufacturers have done better so far this year than they expected to, and a good fall business is in prospect. Not much of this has yet been placed, however, so a good tonnage of September copper is likely to be booked during August. The situation bears no resemblance, however, to the hand-to-mouth conditions that prevailed in the late winter. Wire business has, perhaps, been a little disappointing lately, but brass has stood up well, considering the season.

NEW YORK METAL MARKET PRICES

	July 25, 1928 Cents per Pound	Aug. 1, 1928 Cents per Pound
Copper electrolytic	14.525	14.5375
Lead, Am. S. & R. price	6.20	6.20
Antimony	9.50	10.00
Nickel, ingot	35	35
Zinc spots	6.55	6.55
Tin, Straits	48.25	48.125
Aluminum, 99 per cent.	24.30	24.30

Base copper wire price Aug. 1, 1928, 16½ cents.

Buying Light but Prospects Active on Pacific Coast

Manufacturers report a week of poor buying although good prospective business is reported. Such business covers $100,000 worth of synchronous condenser and transformer equipment for the San Joaquin Light & Power Corporation and approximately $1,000,000 worth of transformers for delivery in the next nine months. Power company orders include $4,000 worth of poles for Walnut Grove, 10,000 pole steps, and a carload of miscellaneous hardware. Railroad purchasing is very quiet. A feature of the week's buying is the many orders for heavy cables. Dealers in Central Valley report an excellent fan year with all orders conservatively estimated at one-third better than last year largely because of prolonged radio business.

Prospective business includes about $250,000 worth of neon type transformers, now in abeyance pending interpretation of a patent suit decision, $25,000 worth of furnace transformers, a $1,500 signal system for Butte County hospital, a $500,000 hospital in Orange, a $1,000,000 Biltmore hotel for Pheonix, Ariz., and a proposed $2,500,000 court building for San Francisco. Los Banos has let a contract for $14,700 covering its street light system and the cities of Arbuckle and Glendale are now figuring on similar systems. In general this class of business was prominent in June but is tapering off since July 1. The Modesto Irrigation District proposes to spend approximately $75,000 for substation improvements, $10,000 for a telephone line and $70,000 for a power line extension.

The Puget Sound Power & Light Company is planning a 7,500-kva. hydroelectric plant at Electron near Tacoma and will soon buy the needed equipment. During a three-month period covering 75 business days the Puget Sound Power & Light Company in northwest Washington and Seattle sold 4,861 electric ranges while the city of Seattle's municipal utility, during the same period sold 765 in Seattle only. Included in motor sales was an order from a Tacoma sawmill for 40 machines, ranging from 150 hp. down and about $6,000 worth to a Tacoma box factory, ranging from 100 hp. down. Aside from these two orders, about 80 other motors from 75 hp. down were reported sold to mills for extensions and replacements, and to dealers and irrigation and cold storage plants. A three-hundred-thousand-dollar straw and box board factory is projected in Spokane, a lumber mill in Olympia and a sixty-thousand-dollar lumber mill in Skagit County, destroyed by fire, will be rebuilt and electrified immediately. Construction projects are as follows:

Sacramento, Calif., has called a special election for Aug. 28 to approve a bond issue of $305,000 for a municipal fire alarm system and building. The Signal Corps Procurement District, Presidio of San Francisco, will receive bids until Aug. 31 for reel carts, frame assemblies and other signal equipment (Circular 6). The Loveland Light & Power Company, Loveland, Colo., plans a steam power plant in connection with its hydro-electric power station to cost $60,000. The Midland Elevator Company, Idaho Falls, Idaho, plans a grain elevator to cost $90,000. The Biles-Coleman Lumber Company, Omak, Wash., plans an addition to cost $200,000. Seattle, Wash., plans a substation to cost $200,000. The Egyptian Lacquer Manufacturing Company, Seattle, Wash., plans a mill to cost $80,000. Los Angeles, Hanford, Sacramento and San Leandro, Calif., and Milford and Salt Lake City, Utah, plan ornamental lighting systems.

Business Increasing in Middle West

The volume of business transacted in the Middle West is increasing. Reports from wholesale mercantile houses indicate an increase in business although retailers report a slight falling off in the volume of sales. The automotive, steel and railroad industries are in excellent shape. The various utility companies continue their construction and line extension work with a very large amount of underground construction in the Chicago district. The demand for major apparatus is somewhat limited although maintenance requirements are quite heavy. Interesting orders placed include a quantity of power and lighting transformers valued at $20,000, turbogenerator spare parts valued at $50,000, and construction orders totaling $70,000. Jobbers' sales are increasing. Construction projects are as follows:

The Miehle Printing Press & Manufacturing Company, Chicago, plans an addition to cost $450,000. The Cameron Can & Machinery Company, Chicago, will build an addition to cost $100,000. The Fleischman Yeast Company, Cincinnati, Ohio, will build a new plant at Pekin, Ill., to cost $400,000. The Graham-Paige Motor Company, Detroit, plans additions to its plant at Evansville, Ind., to cost $500,000; and will make expansions at the Detroit and Wayne, Mich., plants to cost $700,000. The Hart-Parr Company, Charles City, Iowa, plans improvements at its tractor engine plant to cost $150,000. The Oakland Motor Car Company, Pontiac, Mich., will build an assembling plant at Regina, Sask., to cost $400,000.

The International Harvester Company, Chicago, plans a distributing plant at St. Cloud, Minn., to cost $150,000. The Etna Rubber Company, Ashtabula, Ohio, plans additions to cost $100,000. The Fairfield Paper Box Company, Baltimore, Ohio, plans an addition to cost $90,000. The P. Goldsmith & Sons Company, Cincinnati, Ohio, plans an addition to its sporting goods plant to cost $100,000. The Winton Engine Works, Cleveland, plans two units to cost $80,000. The Armstrong Furnace

Company, London, Ohio, plans a plant at Columbus, Ohio, to cost $100,000. Toledo, Ohio, will spend $30,000 for extensions in its underground fire and police alarm system and plans a central building to cost $200,000.

The New York Central Railroad Company, Toledo, Ohio, plans an electric-operated car dumping plant to cost $400,000. The Willys-Overland Company, Toledo, Ohio, plans an addition to cost $250,000. The Wisconsin Power & Light Company, Madison, Wis., plans substations at Stoughton and Spring Green, Wis., to cost $60,000. Glenview and Highland Park, Ill., Sidney, Neb., Waupaca and Madison, Wis., plan ornamental lighting systems.

Reduced Sales Volume in Eastern District

While inquiries for standard electrical equipment continue on a satisfactory basis in the Eastern district, there has been a noticeable decline in actual orders, although it is considered only seasonal. Metropolitan utilities and railroads are the most promising prospective buyers of substation equipment. A steam railroad at New York has placed a contract for equipment for transformer rebuilding to an amount of $40,000. A central station in Oklahoma has placed an order for substation apparatus, including switching and control equipment. Another manufacturer of control apparatus says that trade in this line is decidedly active in the Central and Northwestern districts with marked indications for continuance, and that the Eastern territory seems to be the only locality which is limiting purchases at the present time. Inquiries for switching equipment for heavy line service in the Eastern district give fair promise of early future orders of sizable character, particularly in connection with indoor types.

Industrial motors show an improved tone and sizable business is looked for from several branches of trade, including metal-working plants, iron and steel mills, cement mills, woodworking, chemical and affiliated lines. Orders for fractional horsepower units have excellent prospects within the next few weeks, based on incoming inquiries from makers of appliances and other small equipment. There has been a noticeable increase in demand for electric welding apparatus. Electric elevators are in good demand in the metropolitan district. Immediate construction activities in the Eastern district includes the following:

R. Hoe & Company, New York, manufacturer of printing presses, will build a new plant to cost more than $500,000. The Brockway Motor Truck Corporation, Cortland, N. Y., plans an addition to cost $100,000. The Yonkers Electric Light & Power Company, Yonkers, N. Y., will build a substation to cost $30,000. The Asiatic Petroleum Company, New York, will build a refinery at Baltimore, Md., to cost $1,000,000. W. & J. Sloane Manufacturing Company, New York, plans additions to its linoleum mill at Trenton, N. J., to cost $600,000.

The Philadelphia Steam Company, Philadelphia, recently organized, plans to build a central steam heating power plant to cost $4,000,000. The Pennsylvania Power & Light Company, Allentown, Pa., has purchased property at Hellertown, Pa., for a proposed substation to cost $100,000. The Hercules Powder Company, Wilmington, Del., plans a nitric acid plant at its works at Carthage, Mo., to cost $250,000. Wilmington, Del., will extend its waterworks at a cost of $3,000,000. The Eastern Shore Public Service Company, Salisbury, Md., plans a transmission line from Ridgely to Cordova. The Glenn L. Martin Company, Cleveland, plans an aircraft plant at Baltimore, Md., to cost $500,000. The Signal Corps Procurement District, Governors Island, N. Y., will receive bids until Aug. 21, for 550,000 ft. twisted-pair wire (Circular 2).

Motor and Transformer Sales Good in St. Louis

All manufacturers in the St. Louis district report continued good business in stock sizes of motors and transformers for industrial uses. Orders placed include a switch board for $1,600 and a lot of motors and industrial substation equipment, amounting to $3,250. Several orders of contract size are pending. Some fair-sized shipments of line construction materials are reported. Construction projects are as follows:

Kaplan, La., will receive bids until Aug. 14 for equipment for municipal electric light and water plant. C. C. Thompson, W. E. Reed and associates, Colorado, Tex., plan a feed milling plant to cost $80,000. Wynne, Ark., plans an ornamental lighting system.

Paper Mill in Alabama Buys Motor Equipment

Sustained activity is reported in the Southeast, with small orders constituting the greater portion of the business volume. A large order placed was for hydro-electric generator equipment totaling $110,000 for a power development in South Georgia. Some other central-station orders were for watt-hour meters amounting to $14,200, solid copper wire totaling $9,200 and $4,100 worth of distribution transformers. An order for power transformers aggregating $10,000 is in immediate prospect and will probably be closed this week.

An order has been placed for elevator equipment amounting to $70,000 for installation in a railway company office building addition, and a cotton mill in Georgia ordered three 100-kva. transformers. A paper mill in Alabama will this week place orders for motor equipment and wiring materials to the extent of $300,000. The City of Atlanta placed orders for panelboards and stage lighting equipment amounting to $4,000, this equipment to go into new public school buildings. A smaller town in Georgia is soon to purchase equipment for a 65 standard "white-way" system. The Babcox & Wilcox Company have announced construction plans for a refractories plant at Augusta, Ga., the eventual investment to total $1,000,000. Construction projects are as follows:

The Saratoga Victory Mills, Albertville, Ala., will build cotton mills at Albertville and Guntersville, Ala., to cost $400,000. The American Chatillon Corporation, New York, plans a power house at its proposed rayon mill at Rome, Ga., to cost $3,000,000. The Shannon Brighton Mills, Shannon, Ga., plans an addition to cost $100,000. The Kentucky Marconi Company, Louisville, Ky., plans an addition to cost $75,000. The Mississippi Power & Light Company, Jackson, Miss., will build a 13,000-volt transmission line from Jackson to Flora, and will also install a substation at Durant to cost $50,000.

The May Hosiery Mills, Inc., Burlington, N. C., plans an addition to cost $60,000. The Davenport Brooks Corporation, Fort Pierce, Fla., plans a fish canning plant at Beaufort, S. C., to cost $100,000. Yarns Corporation of America, Inc., Spartanburg, S. C., plans extensions in processing mill to cost $200,000. The Aragon-Baldwin Cotton Mills, Inc., Whitmire, S. C., plans an addition to cost $100,000. The Pennsylvania Railroad Company, Pittsburgh, Pa., will build an engine house with repair facilities etc., at Benwood, W. Va., to cost $200,000.

New England Buying Power Equipment

Power equipment orders placed in New England include a 12,500-kw. turbo-generator unit for the Boston Edison Company. This unit will be installed in the Edgar station and will operate at a pressure of 1,200 lb. per sq.in. Other orders for turbo-generators include a 3,000-kw. unit for a Middle Western plant, and a 200-kw. and a 300-kw. unit for Massachusetts. Small motor orders are being received in good volume. During the past week the total reached over $35,000. Switch and control apparatus orders are steady. A slackening in transformer sales is noted although an interesting order is expected from a New Hampshire company.

Transmission line material is moving in good volume. Car load shipments of wire, poles and cross-arms to points in eastern Massachusetts and southern New Hampshire are recorded. Fiber conduit, cable, and black pipe orders are heavy. A city in Massachusetts recently installed four new electrically operated traffic control signals. Electric time control apparatus is attracting attention and a number of sales are reported. Changes in textile plants requiring special control for rayon production have reflected a steady demand for indicating meters.

Orders for electric refrigerators are numerous. An outstanding order for 1,000 domestic units was placed last week, and one distributor reports deliveries several weeks behind owing to increased demand for these appliances. Southern New England reports show a healthy industrial trend. New contracts are apace with last year though industrial building expansion is checked to some extent. Construction projects are as follows:

The Peoples Hydro-Electric Vermont Corporation, Montpelier, Vt., will build a hydro-electric project on the Winooski River, near Montpelier, to cost $200,000, with transmission line.

Activities of the Trade

American Brown Boveri Buys Packard Transformer

The transformer division of the Packard Electric Company, Warren, Ohio, has been purchased in its entirety by the American Brown Boveri Electric Corporation, according to an announcement made this week. The Packard company, in its transformer division, has made a wide range of transformers, comprising power, distribution, instrument and metering types, in its plant at Warren, Ohio, for the last 38 years. These transformers will be continued in all types and sizes under the established trademark "Packard."

The American Brown Boveri company states that the manufacturing and engineering facilities will be consolidated with those of its other departments at the Camden, N. J., plant. The types and sizes of transformers represented by the Packard division when added to the high-tension, large capacity transformers now manufactured by the American Brown Boveri company at Camden will provide a line wide enough in scope to fill any transformer requirement. It is understood that N. A. Wolcott, president of the Packard Electric Company, will become affiliated with the American Brown Boveri company.

Westinghouse Company Gets Supervisory Control Orders

The Los Angeles Gas & Electric Company has placed an order with the Westinghouse Electric & Manufacturing Company for two synchronous-visual type supervisory control equipments for controlling its No. 5 and No. 10 substations. The Westinghouse company also has sold three supervisory control equipments of the synchronous-visual type to the Pennsylvania-Ohio Power & Light Company. The Wisconsin Gas & Electric Company also has placed an order for a synchronous-visual type supervisory control equipment to remotely control its Albers Street substation at Kenosha, Wis. Another order was recently received by the Westinghouse company from the Southwestern Light & Power Company, Temple, Okla., for three audible type supervisory control equipments.

The Westinghouse company also received an order from the city of Philadelphia for three large synchronous motors, including switching equipment, to be used in driving Fairbanks-Morse centrifugal pumps in the Belmont pumping station of that city. Contracts also have been placed for the electrification of two paper mills equipped with Westinghouse sectional electric drives. One of these paper machines will be located on the Pacific Coast in the Port Townsend, Wash., plant of the National Paper Products Company, a subsidiary of the Crown-Zellerbach Corporation. The other will be located on the opposite side of the continent, in northeast New England, in the plant of the Champion International Company, Lawrence, Mass.

Vermont Orders Equipment for Hydro Development

The Peoples Hydro-Electric Vermont Corporation recently ordered two S. Morgan Smith waterwheels, to operate under a 48-ft. head and develop about 4,500 hp. In addition, two vertical type Westinghouse generators, rated at 2,000 kva. each, were purchased. Work on this development is progressing rapidly and operation is expected in the early fall.

Kellems Products Now Making Kellems Cable Grips

The formation of Kellems Products, Inc., 6 Varick Street, New York City, to manufacture the Kellems cable grip, has been announced. The company states that it controls all the rights to manufacture and sell the Kellems cable grip under patent No. 1,670,543, issued in the name of Edgar E. Kellems, the inventor. The Kellems cable grip is made with an endless weave and the wires terminate in a solid steel eye. The shoulder of the grip is protected and reinforced by tubing which is an integral part of the grip. For unusually heavy pulls the grip is furnished in solid steel wire. The special wire of which all Kellems grips are made is in accordance with the specifications of the American Telephone & Telegraph Company. Indicative of the strength of this design, the company states that the 2½- and 3-in. grips were recently tested in an Olsen testing machine to an ultimate strength of 18,000 lb.

THE LOCKE INSULATOR CORPORATION, Baltimore, Md., announces that J. E. Slimp has been appointed special representative of the company, and his duties in that capacity will be those assigned by the president. Mr. Slimp will continue his connection with the New York office at 120 Broadway.

THE DAY & ZIMMERMANN ENGINEERING & CONSTRUCTION COMPANY announces the removal of its Philadelphia offices to 112 North Broad Street, Philadelphia.

THE WAGNER ELECTRIC CORPORATION, St. Louis, announces that Fred Johnson is now manager of its Los Angeles branch sales office. Mr. Johnson has been with the company for 21 years and until recently was in charge of its St. Louis sales office. The company also announces that Alex L. Miltenberger, formerly Pacific Coast manager of the company, with headquarters in San Francisco, has been transferred to the St. Louis office as branch manager.

THE REYNOLDS ELECTRIC COMPANY, 2650 West Congress Street, Chicago, manufacturer of fractional-horsepower motors and motor-driven appliances, announces that it has taken over the Korrectolite Company, Chicago. Eben F. Oliver, formerly general manager of the Korrectolite Company, has become associated with the Reynolds organization.

LANDERS, FRARY & CLARK, New Britain, Conn., manufacturers of electrical appliances, announce a new model No. 42 "Universal" vacuum cleaner selling for $29.50.

THE PEERLESS ELECTRIC COMPANY, Warren, Ohio, has opened a branch sales office at Room 807, Dodge Building, 53 Park Place, New York City, with Dick Rairigh in charge.

THE WILLIAMS OIL-O-MATIC HEATING CORPORATION, Bloomington, Ill., has placed on the market a new fully automatic oil burner, known as "Dist-O-Matic," for heating small homes of five to seven rooms. The "Dist-O-Stove," also announced by the company, is a gravity type heater for cottages summer homes, etc.

THE BODINE ELECTRIC COMPANY, 2254 West Ohio Street, Chicago, manufacturer of fractional-horsepower electric motors and electric phonograph turntables, announces the appointment of H. D'Almaine as assistant sales manager. Mr. D'Almaine was formerly advertising manager of the Louis Allis Company, Milwaukee.

THE AMERICAN CIRCULAR LOOM COMPANY, 90 West Street, New York City, manufacturer of "Loomflx" flexible conduit, "Electroduct" enameled conduit, etc., announces a change in its selling organization. The company has added to its sales force Jones-Lyman & Company, Inc., with offices at Los Angeles and San Francisco, who will operate throughout California, and also Hawkins, DeMoss & Fox, Inc., who will supervise the company's sales force in and about the cities of Detroit and Toledo and throughout eastern Michigan. Its Chicago office will continue, as heretofore, in charge of George Richards & Company.

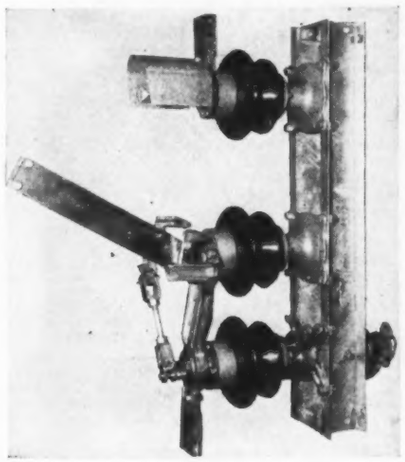
THE ROLLER-SMITH COMPANY, 233 Broadway, New York City, manufacturer of electric instruments and circuit breakers, announces the appointment of Elliott E. Van Cleef, 53 West Jackson Boulevard, Chicago, as its district sales agent in the Chicago territory. Michael B. Mathley, who has been connected with the Chicago office for many years, will be associated with Mr. Van Cleef.

MATHIAS KLEIN & SONS, 3200 Belmont Avenue, Chicago, manufacturers of linemen's tools, etc., have purchased property, 173 ft. x 578 ft., at Wrightwood Avenue, on the Chicago, Milwaukee & St. Paul Railroad, and will use it for further expansion.

New Equipment Available

Group-Operated High-Current Disconnecting Switch

For high-current outdoor service the type RP disconnecting switch is being offered by the General Electric Company. The company states that this switch incorporates those features which operating practice and research prove essential to disconnecting switches for heavy currents. A side view of a single-pole unit rated at 3,000 amp. is shown in the accompanying illustration. The switch is group operated and of the vertical-break, rotating-insulator type. It makes use of a wedge and plunger arrangement which produces high pressure of the blade against both the hinge and contact ends. It is said that operation of the switch is effected with exceptional ease and in one movement of the mechanism. The wedges which apply the pressure cannot function until the blade is closed. The ratings are 7,500, 15,000, 25,000 and 37,000 volts, 2,000, 3,000 and 4,000 amp.



Single-pole unit of 3,000 amp. type RP disconnecting switch

Transformer Tap Changer

A tap-changing equipment for changing transformer taps under load and which is arranged for mounting directly on the transformer tank has been placed on the market by the Westinghouse Electric & Manufacturing Company. The tap-changer housing is divided into two oil-filled compartments by means of a base plate on which the tap-changing switch bushings, camshaft and toggle mcehanism are mounted. The upper compartment opens directly into the transformer, facilitating connection of transformer leads and completely immersing them in oil. The lower parts of the bushings extend into the lower compartment and carry the stationary contact feet. To withstand the frequent service required, condenser bushings with wedge-shaped contacts are used.

The moving contact is operated from a toggle and cam-operating mechanism. Proper sequence of operation is assured by forced opening and closing of the contacts. By using small diameter cams the main operating camshaft is machined from one piece of steel. The equipment is designed for either hand or remote control operation. Only one switch operation is needed per tap change and every position is an operating position. Oil-less graphite bearings are used throughout.

Grounding Switch

A complete line of grounding switches making use of the "Hi-Pressure" contact has been developed by the Railway & Industrial Engineering Company, Greensburg, Pa. The pressure jaw is mounted at the jaw end of the line switch and the hinge base is mounted in line with the base of the line switch. The blade is made of copper tubing, with a toggle which makes contact by straightening out into the "Hi-Pressure" jaw when the contact end meets a stop, cleaning the contact surfaces of dirt, ice and corrosion. These grounding switches are available in all voltages up to 220 kv.

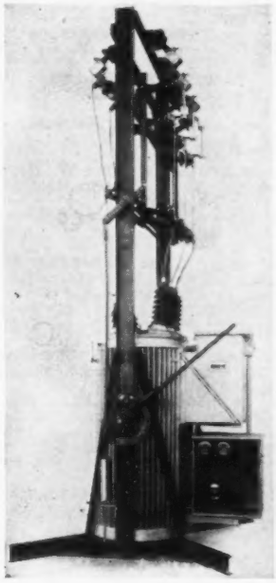
Cinder Removal Stack

The "Thermix" stack, type 4, for removing cinders, dust and fly-ash from stoker and pulverized-coal-fired furnace flue gas has been developed by the Prat-Daniel Corporation, 101 Park Avenue, New York City. The principle of operation of the stack (or induced-draft fan without stack) is the concentration of the dust by means of a prolonged involute of the fan, the continuous withdrawal of 5 to 15 per cent of this gas, the precipitation of the dust in a cyclone and the return of the cleaned gas from the cyclone to the suction side of the fan. The advantages noted are: High efficiency of cinder removal, low power consumption, effectiveness at all boiler ratings, small space occupied, regulation accurately controlled and no resistance when using natural draft.

TEST BLOCKS AND PLUGS.—A line of test blocks and plugs which provide a simple means of making connections when testing meters, instruments and relays has been developed by the General Electric Company. They are designated as type PK. The blocks are essentially four-pole and six-pole jacks, provided with covers having internal plug contacts which make a through-connection when the plug is in place. The four-pole and six-pole blocks are provided with various combinations of auxiliary contacts which automatically short circuit the current transformer when the cover is removed. Thus a block and cover are equivalent to a double-throw test switch.

Unit Substation

A substation which in one unit combines a power transformer, switching facilities, overload and short circuit protection and means of metering has been developed by the Condit Electrical Manufacturing Corporation of Boston. In this substation unit, as shown in the illustration, a standard three-phase, star-connected primary power transformer of the usual design is used, except that it is arranged for inserting an oil circuit breaker in the connection between the primary winding and the common or star connection point. This oil circuit breaker, because of the transformer reactance, has a very small proportion of the interrupted capacity that would be required if the oil circuit breaker was installed on the line side of the transformer. Series-wound type current and potential transformers suitable for metering are placed within the power transformer compartment.



Combined substation unit

A set of primary and if desired secondary disconnects are mounted above the transformer on a channel iron structure integral with it. The disconnects are interlocked with the oil circuit breaker, thereby insuring that neither load current nor magnetizing currents can be interrupted by the disconnecting switches. Protection for the primary leads and windings is afforded by a fuse rated for short-circuit current only. Overload protection is secured from secondary current transformers energizing trip coils of the oil circuit breaker. The company states that the whole structure makes a compact unit, resulting in great economy of equipment and installation cost, combined with ease of operation and maintenance.

Electrical Patents

Announced by U. S. Patent Office

(Issued July 10, 1928)

1,676,656. RESISTANCE WELDING ELECTRODE; G. A. Lutz, Cranford, N. J. App. filed Oct. 21, 1926.

1,676,669. ELECTRIC COOKING AND HEATING DEVICE; O. Schaffler, Detroit, Mich. App. filed Aug. 3, 1927.

1,676,677. ELECTRICALLY HEATED DENTAL FLASK; M. L. Axelrod, Cleveland, Ohio. App. filed June 28, 1926.

1,676,680. ELECTRIC TRANSMISSION OF SIGNALS ALONG LINES FOR POWER DISTRIBUTION; J. Bethenod, Paris, France. App. filed Jan. 4, 1923.

1,676,728. INCANDESCENT-LAMP LOCK; J. Cooke, New York, N. Y. App. filed March 12, 1927.

1,676,743. PUSH-BUTTON APPARATUS FOR MULTIPLE-UNIT DOOR-CONTROL SYSTEMS; A. F. Paul, Llanerch, Pa. App. filed Dec. 17, 1921.

1,676,745. ELECTRICAL REACTANCE; G. W. Pickard, Newton Center, Mass. App. filed Sept. 24, 1924.

1,676,752. LIQUID-FLOW ELECTRIC SWITCH; W. R. Walker, Great Kills, N. Y. App. filed Nov. 25, 1924.

1,676,753. LIQUID-FLOW SWITCH; W. R. Walker, Great Kills, N. Y. App. filed April 21, 1925.

1,676,754. MERCURY SWITCH; W. R. Walker, Great Kills, N. Y. App. filed June 17, 1925.

1,676,768. TRANSFORMER AND CIRCUIT; L. J. Buttolph, Grantwood, N. J. App. filed Jan. 24, 1923.

1,676,779. DEVICE FOR UNDERGROUND PROSPECTING; S. Herr, Crawfordsville, Ind. App. filed Dec. 20, 1926.

1,676,790. ELECTRIC LAMP; R. D. Mailey, East Orange, N. J. App. filed April 18, 1922.

1,676,791. MERCURY SWITCHING APPARATUS; R. D. Mailey, East Orange, N. J. App. filed Oct. 12, 1923.

1,676,792, 1,676,793. VAPOR ELECTRIC LAMP; R. D. Mailey, East Orange, N. J. Apps. filed Jan. 17, 1924, and Feb. 1, 1924.

1,676,794. THERMOSTATICALLY-CONTROLLED SWITCH; R. D. Mailey, East Orange, N. J. App. filed May 5, 1925.

1,676,834. ELECTRIC RADIATOR; T. H. McQuinn, London, England. App. filed Nov. 29, 1924.

1,676,850. ELECTRIC FLASHER SWITCH MECHANISM; C. H. Bissell, Syracuse, N. Y. App. filed Feb. 26, 1925.

1,676,869. RESISTANCE UNIT AND RHEOSTAT; H. G. Richter, Roselle Park, N. J. App. filed Jan. 28, 1927.

1,676,876. CONSTANT-TEMPERATURE OVEN; W. H. Stannard, Matteson, Ill. App. filed Nov. 30, 1925.

1,676,920. LIQUID CONTACT ELECTRICAL SWITCH; L. A. M. Phelan and C. Hotchkiss, Beloit, Wis. App. filed Nov. 29, 1922.

1,676,921. ELECTRICAL CONTACT APPARATUS; L. A. M. Phelan and C. Hotchkiss, Beloit, Wis. App. filed Dec. 23, 1922.

1,676,922, 1,676,923. ELECTRICAL CONTACT APPARATUS; L. A. M. Phelan, Elkhart, Ind. Apps. filed July 19, 1923, and Dec. 23, 1923.

1,676,926. HIGH-FREQUENCY FURNACE; H. C. Rentschler and J. W. Marden, East Orange, N. J. App. filed Jan. 5, 1925.

1,676,944. GUARD BRACKET FOR ELECTRIC WIRES; L. Davison, Edmon, Pa. App. filed Aug. 20, 1927.

1,676,945. DRY-CELL BATTERY; L. V. Ellis, New York, N. Y. App. filed Jan. 5, 1928.

1,676,949. METHOD OF SOLDERING LEADING-IN WIRES TO LAMP BASES; J. J. Higgins, East Orange, N. J. App. filed April 21, 1923.

1,676,967. TERMINAL FOR ELECTRIC CONNECTIONS; L. J. Simon, London, England. App. filed Nov. 29, 1924.

1,676,971. PULL-BUTTON-CONTROLLING SWITCH; A. B. Weaver, Philadelphia, Pa. App. filed June 1, 1923.

1,676,973. VIBRATORY CONVERTER; R. D. Amsden, Lynn, Mass. App. filed Aug. 24, 1922.

1,676,974. AUTOMATIC RECLOSING CIRCUIT-BREAKER SYSTEM; A. E. Anderson, Schenectady, N. Y. App. filed April 15, 1922.

1,676,979. VIBRATORY CONVERTER; R. T. Cheeseman, Lynn, Mass. App. filed Aug. 24, 1922.

1,676,985. AUTOMATIC ARC-WELDING MACHINE; F. A. Haughton, Schenectady, N. Y. App. filed Sept. 14, 1925.

1,676,990. DIRECT CURRENT SYSTEM OF DISTRIBUTION; A. H. Mittag, Schenectady, N. Y. App. filed July 13, 1923.

1,677,000. ELECTRIC DISCHARGE DEVICE; D. M. Moore, East Orange, N. J. App. filed March 5, 1921.

1,677,003. TRANSFORMER FOR ELECTRIC-ARC CUTTING, REPAIRING, AND WELDING APPARATUS; F. C. Owen, Fayetteville, N. C. App. filed Aug. 18, 1927.

1,677,004. MAGNETIC SHIELD FOR DYNAMO-ELECTRIC MACHINES; R. Pohl, Berlin, Germany. App. filed Feb. 17, 1927.

1,677,005. NON-WARPING HOT PLATE; L. Reichold, Winsted, Conn. App. filed Sept. 15, 1927.

1,677,007. COIL WINDING; I. H. Summers, Lynn, Mass. App. filed Dec. 29, 1925.

1,677,008. ROTARY SWITCH MECHANISM; G. R. Townsend, Schenectady, N. Y. App. filed Dec. 12, 1925.

1,677,016. QUARTZ APPLICATOR FOR THERAPY; E. R. Berry, Malden, Mass. App. filed July 1, 1926.

1,677,024. SOLENOID BRAKE; J. Eaton, Schenectady, N. Y. App. filed April 1, 1927.

1,677,025. COMPENSATED METER; A. G. Grier, Peterboro, Can. App. filed Dec. 8, 1925.

1,677,027. METHOD AND MEANS FOR CONNECTING WINDMILLS WITH ELECTRIC GENERATORS; L. Constantin, Paris, France. App. filed Feb. 5, 1925.

1,677,029. THERMOELECTRIC GENERATOR; T. S. Fuller, N. H. Adams and F. G. Nolte, Schenectady, N. Y. App. filed Nov. 27, 1925.

1,677,030. MAGNET WHEEL; J. Geschke, Berlin, Germany. App. filed March 31, 1926.

1,677,032. ELECTRICAL HEATING AND COOKING APPARATUS; J. W. J. Kaffer, Meester-Cornelis, Java, Dutch East Indies. App. filed Nov. 9, 1926.

1,677,054. HEATER-SUPPORTING CHANDELIER; L. E. Shaw, East Orange, N. J. App. filed Dec. 11, 1925.

1,677,059. ELECTRICAL CONTACTOR; P. M. Tebbs, Harrisburg, Pa. App. filed Dec. 1, 1924.

1,677,084. HIGH VOLTAGE TRANSFORMER; A. B. Hendricks, Jr., Pittsfield, Mass. App. filed Sept. 2, 1927.

1,677,106. TIME SWITCH; J. G. H. Liebel and E. S. Flarsheim, Cincinnati, Ohio. App. filed Oct. 10, 1921.

1,677,107. TIME SWITCH; E. S. Flarsheim, Cincinnati, Ohio. App. filed March 23, 1925.

1,677,114. LIGHT SOCKET; O. S. Field, Roselle, N. J. App. filed April 6, 1921.

(Issued July 17, 1928)

17,041 (reissue). AUTOMATICALLY-CONTROLLED VAPOR-CONVERTER SUBSTATION; W. V. Lovell, New York, N. Y. App. filed April 13, 1923.

1,677,157. SYSTEM FOR MEASURING CONTACT REBOUNDING OR "CHATTER"; A. Weaver, Brooklyn, N. Y. App. filed Feb. 25, 1925.

1,677,161. DEVICE FOR ELECTRIC WELDING; A. H. Adams, La Grange, Ill. App. filed May 25, 1925.

1,677,177. ELECTRIC TOASTER; H. C. Drake, Hempstead, N. Y. App. filed Jan. 2, 1926.

1,677,193. SHORT-CIRCUITING SWITCH; R. G. McCurdy, Englewood, N. J. App. filed Sept. 2, 1927.

1,677,203. METER FOR COMBINING THE MEASUREMENT OF DEMAND AND ENERGY; L. A. Paine, Toronto, Ont., Can. App. filed Feb. 3, 1927.

1,677,205. DEVICE FOR WELDING PARTS; E. Pugh, Chicago, Ill. App. filed May 25, 1925.

1,677,206. METHOD OF ELECTRIC WELDING; E. Pugh, Chicago, Ill. App. filed April 17, 1926.

1,677,214. ELECTRICALLY-HEATED SOLDERING APPARATUS; A. E. Santschi, Chicago, Ill. App. filed July 19, 1926.

1,677,240. IMPROVED RESISTANCE UNIT; F. S. Kochendorfer, River Forest, Ill. App. filed Dec. 27, 1922.

1,677,243. ELECTRIC CONTROLLER; N. D. Levin, Columbus, Ohio. App. filed Dec. 30, 1920.

1,677,248. SOLDERING DEVICE; R. Reinbold, St. Paul, Minn. App. filed Sept. 16, 1927.

1,677,256. SEPARABLE ELECTRICAL CONNECTION; W. C. Tregoning, Cleveland Heights, Ohio. App. filed Jan. 16, 1923.

1,677,280. HEATED TOWEL BAR; A. C. Gilbert, New Haven, Conn. App. filed Jan. 14, 1924.

1,677,281. RADIANT ELECTRIC HEATER; A. C. Gilbert, New Haven, Conn. App. filed Feb. 5, 1926.

1,677,298. THERMAL PLUG CUTOUT; M. J. Sandin, Wilkinsburg, Pa. App. filed Jan. 23, 1923.

Information on foreign patents can be obtained through the nearest district office of the Bureau of Foreign and Domestic Commerce, Department of Commerce.

New Trade Literature

SIGNALS.—Bulletin No. 54 issued by the Benjamin Electric Manufacturing Company, 120 South Sangamon Street, Chicago, describes and illustrates the Benjamin industrial signals. Wiring diagrams and a guide to wire sizes are included.

BALL BEARINGS.—A booklet issued by the New Departure Manufacturing Company, Bristol, Conn., gives the dimensions, load ratings, price list and telegraph code for New Departure ball bearings.

MOTORS, GENERATORS AND ARC WELDING.—Bulletin GEA-724A, GEA-865 and GEA-383B issued by the General Electric Company, Schenectady, N. Y., describe and illustrate its totally inclosed fan-cooled induction motors; the squirrel-cage and wound-rotor multi-speed induction motors and types ATB and ATI low-speed synchronous generators for direct connection to steam and internal combustion engines. The company also is distributing the following bulletins: GEA-569A, covering constant-potential arc welding sets for metallic or carbon electrode welding; GEA-823A, covering atomic hydrogen arc welding equipment; GEA-874, describing belt, motor or gas-engine driven, stationary or portable, single-operator type WD-200A arc welder; GEA-876, describing the type WD-400 A arc welder, and GEA-881 covering the G-E gas-engine driven arc welder.

BREECHINGS and STACKS INSULATION.—The Celite Products Company, 11 Broadway, New York City, has issued bulletin No. 141 entitled "The Insulation of Breechings and Stacks." The bulletin gives specifications covering the lining of stacks and breechings with "Sil-O-Cel" standard brick.

AIR - CUSHIONED COMPRESSOR VALVE.—Bulletin No. 138 issued by the Pennsylvania Pump & Compressor Company, Easton, Pa., covers the Pennsylvania air-cushioned valve.

STEEL DOORS.—Catalog No. 110, issued by the Truscon Steel Company, Youngstown, Ohio, describes the Truscon copper alloy steel doors. The catalog contains illustrations of various types of steel doors, together with specifications and drafting room standards.

BAFFLE WALL.—The Boiler Engineering Company, 931 Federal Trust Building, Newark, N. J., has issued a bulletin covering the "Turner" boiler baffle wall and the "Beco" baffle wall.

CRANES, LATHES, ETC.—"On Land-On Water-In the Air" is the title of a booklet issued by the Niles-Bement-Pond Company, 111 Broadway, New York, which contains an illustrated description of the Niles-Bement-Pond Company's products and their application to various industries from the first railroad to the airplane.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Purchase is desired in Bologna, Italy (No. 32,339), of electro-medical apparatus.

Purchase and agency are desired in Patras, Greece (No. 32,340), for electric table and ceiling fans.

Purchase and agency are desired in Lausanna, Switzerland (No. 32,327), for household electrical appliances.

Purchase and agency are desired in Rosario, Argentina (No. 32,335), for household electrical appliances, and another (No. 32,374) for X-ray equipment.

An agency is desired in Zurich, Switzerland (No. 32,324), for electrical industrial apparatus.

An agency is desired in São Paulo, Brazil (No. 32,323), for electric railroad supplies and equipment.

Any manufacturer desiring to establish agencies abroad may consult with the nearest district office of the Bureau of Foreign and Domestic Commerce, Department of Commerce, where data on available agencies throughout the world are on file.

Business Facts for Electrical Men

Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business

Energy—An Inexpensive Item in Industry

THAT in the case of a great many manufactured articles the cost of energy constitutes only a small fraction of the total production expense is generally recognized. But definite information is not so commonly to be had.

Based on operations in the year 1925, the ratio of the total cost of energy to the gross annual sales has been computed by one prominent electric light and power company for a number of industrial establishments in its territory. Of thirteen industries which it tabulated only four had a power cost exceeding 2.75 per cent of the value of sales. The middle figure of the thirteen was 1.8 per cent. In three cases the cost was less than 0.5 per cent.

As might be expected, electrochemical industries stand at the head of the list. For example, in ore reduction and in the electrolytic generation of oxygen and hydrogen the absorption of electrical energy is inherent in the process itself.

As soon as that class is passed we get down to ratios of 4 per cent or less. Even in the iron and steel working plants the power cost in the majority of instances is surprisingly low. Where operations are conducted on less resistant materials, or where the operations are complicated and require any considerable amount of human guidance or labor, the power cost becomes almost negligible.

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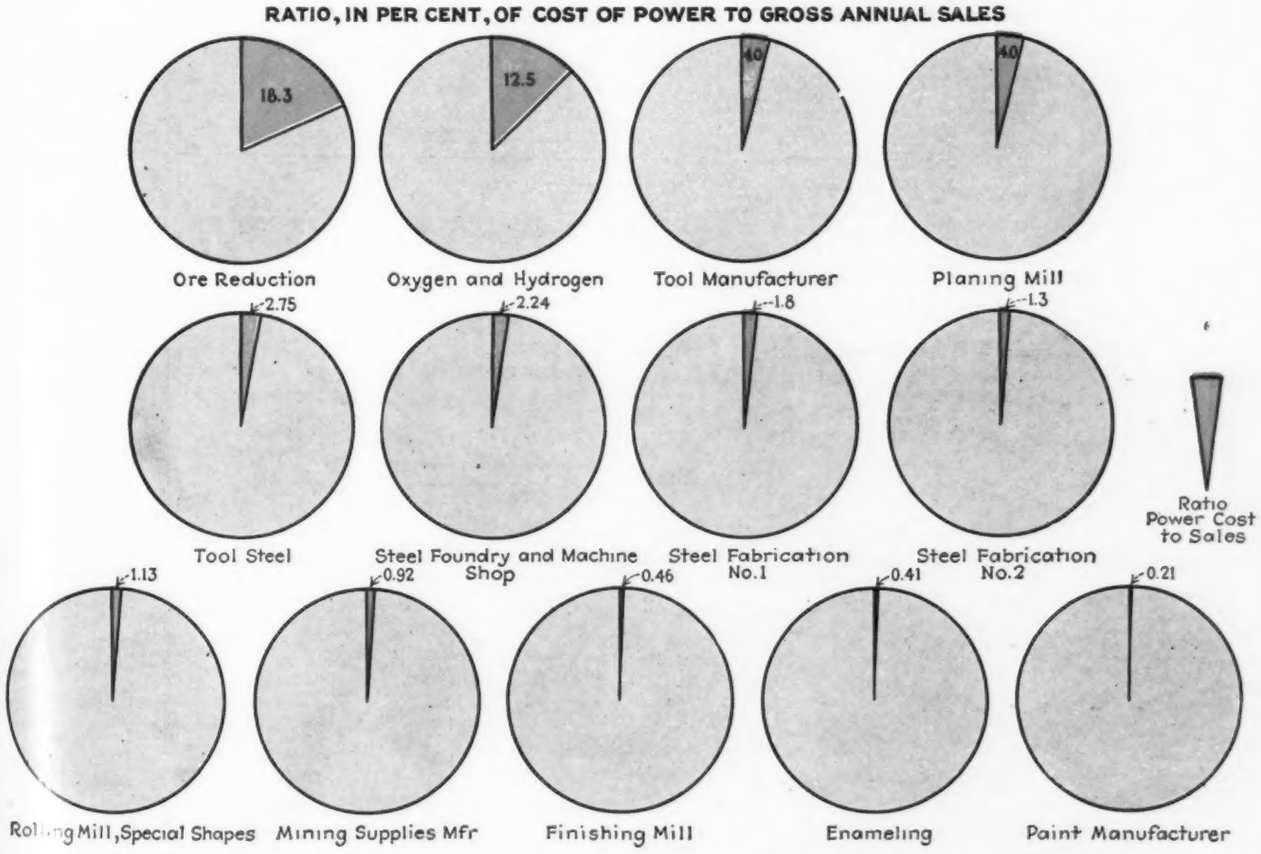
It would be interesting to have additional data for processes other than those here listed. One thing seems clear: The cost of electrical energy is not, in general, a determining factor in production cost. If a given location is favorable as to labor conditions, proximity of raw materials or markets, low transportation charges or any other major item entering into the cost of production and distribution, these will usually outweigh any ordinary differences in the cost of energy. A small percentage variation in any one of them is equivalent to a much larger change in the power rate.

Electrochemical operations must be excepted. Energy there is really one of the raw materials; its cost, therefore, must be weighed like that of any other.

It might be added that nine of the thirteen industrial establishments here charted had a power bill for the year exceeding $12,000; five exceeded $20,000; one ran far higher; none was under $1,500.



Excluding the electrometallurgical and electrochemical processes the power cost averaged only 1.74 per cent of value of product

Continued High Operations in North Central States

INDUSTRIAL conditions in the North Central States during June as indicated by the consumption of electrical energy was of an unusually high order for this season of the year. General industry witnessed a decrease in operations during June of 2.1 per cent, as against a decrease during June, 1927, of 9.5 per cent. In other words, the seasonal decrease during the current year appears to have been of less extent than that which might be expected, based on the seasonal decreases witnessed during previous years. This small decrease resulted in an index of general industrial activity during June about 8.5 per cent above June, 1927. There is every indication that the present summer months will witness industrial operations in the North Central States on a plane well above that of last year.

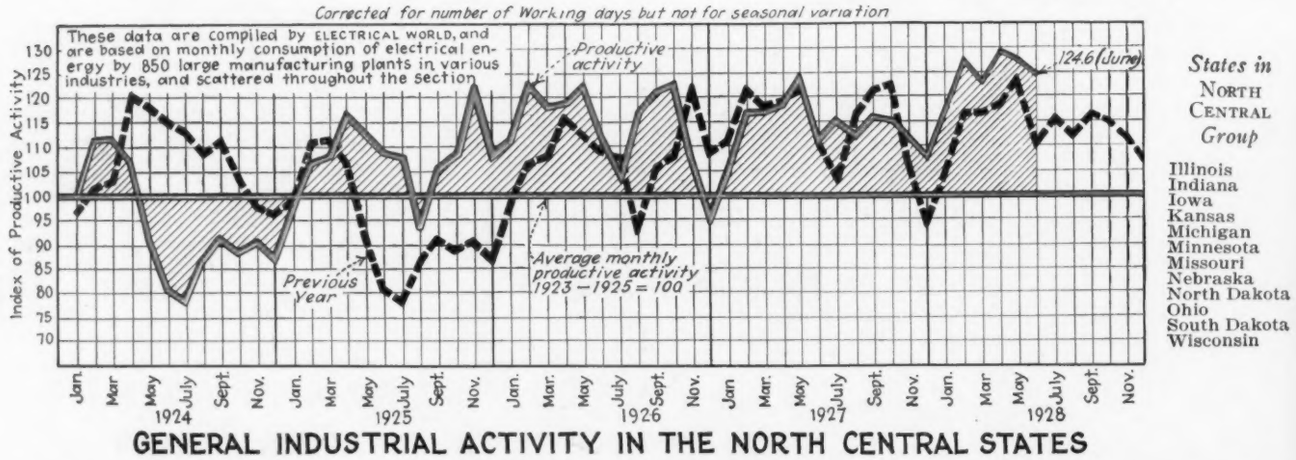
Only two of the primary industrial groups of the North Central States witnessed June operations under those of June last year. The lumber and its products group reported a rate of operations 6.2 per cent under last year and the food and kindred products group was operating on a plane 14 per cent under June, 1927. The leather industry was operating at the same rate as last year.

Indexes of Productive Activity in the North Central States

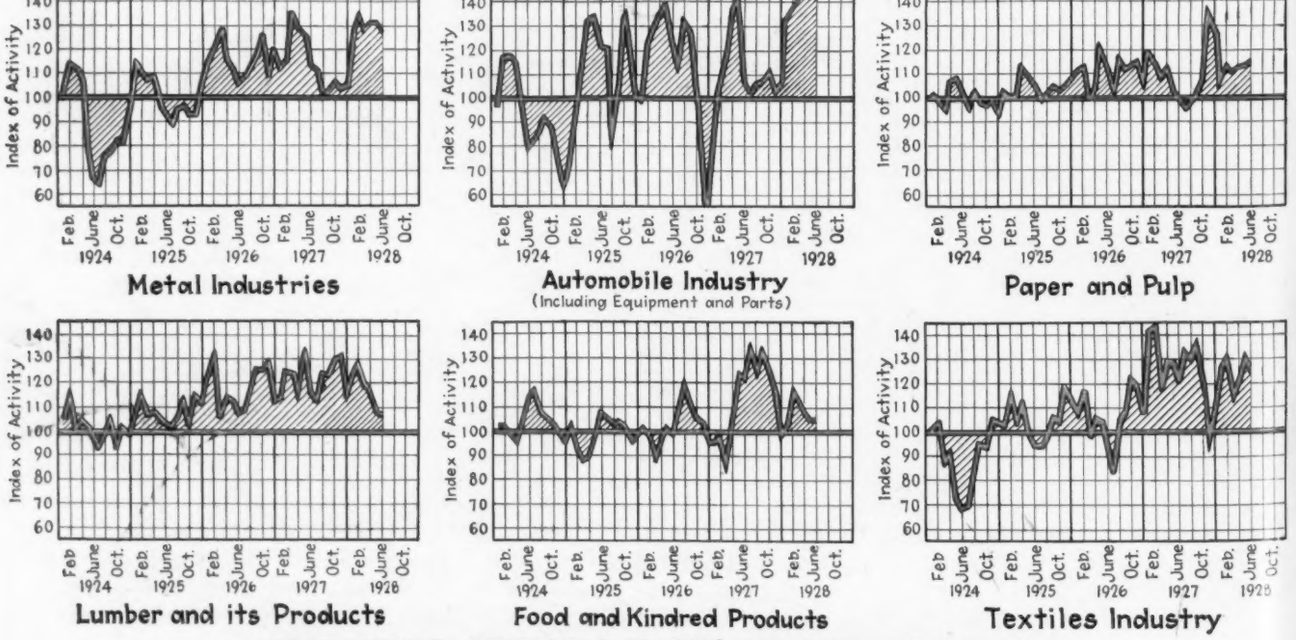
All Figures Adjusted for Number of Working Days

	June, 1928	May, 1928	June, 1927	Average for First Six Months, 1928	Average for First Six Months, 1927
All industries	124.6	127.2	110.9	124.6	115.8
Chemical and allied products	132.3	140.5	97.7	121.1	95.8
Textiles	125.3	131.4	122.4	125.1	131.1
Lumber and its products	107.3	108.2	114.5	117.0	120.6
Paper and pulp	115.4	112.4	98.5	111.6	109.2
Automobile, including the manufacture of parts	141.6	141.6	107.9	142.1	114.6
Metals group	128.5	130.6	112.3	130.6	121.8
Rolling mills and steel plants	127.1	130.6	118.2	130.4	125.2
Metal-working plants	130.0	130.5	106.4	130.9	.....
Food and kindred products	103.9	104.5	120.8	109.1	.....
Leather and its products	103.2	97.7	103.2	107.3	.....
Rubber and its products	131.8	130.8	118.4	135.5	.....
Stone, clay and glass	113.2	116.8	111.2	104.9	.....

ELECTRICAL WORLD *Barometer of Industrial Activity in the North Central States*



GENERAL INDUSTRIAL ACTIVITY IN THE NORTH CENTRAL STATES



PRODUCTIVE ACTIVITY IN THE PRIMARY INDUSTRIES OF THE NORTH CENTRAL STATES